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Makers Consider Code Renewal

NRA Will Conduct Hearing on Extension: New Name for NACC

DETROIT, Aug. 22—The question of renewal of the Automobile Manufacturing Code was referred to the board of directors at the annual meeting held here today of the Automobile Manufacturers Association, the new name adopted at the meeting for the former National Automobile Chamber of Commerce.

Spokesmen for the manufacturers said the question of collective bargaining was not considered as an issue in the automotive industry as its members expect to continue "to operate in accordance with the principles set forth in the President's settlement of last March."

Considerable confusion was occasioned late last week by an NRA announcement that it would hold a public hearing Aug. 27 on an amendment extending the code to June 16 next unless the President should declare the emergency ended at an earlier date. This announcement was subsequently canceled "because the industry's proposals in regard to extension of the code have as yet not been formulated and submitted."

NRA, however, made it clear that the code would not be extended in the routine manner followed when its renewal came up last winter. On this point NRA said: "It is the intention of the administration in view of pressing requests from affected interests, that the proposals of the industry when made shall be the subject of public hearings. The date will be set later." The 'affected interests" referred to, of course, are labor organizations.

What proposals the industry will make now depends on the action of the directors of the A.M.A. Not all of the manufacturers are enthusiastic about renewing the code, although the industry is expected to go along if the code is extended in its present form. Demands for elimination of the "Merit Clause," for shorter hours and for higher wages which William Green, A. F. of L. president, promises to make at the public hearing, will meet with active opposition from manufacturing executives.

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Reo-Mack Sign Sales Contract

A contract has been signed between the Reo Motor Car Co. of New York, Inc., and the Mack-International Motor Co. under which the latter organization will have exclusive distribution of Reo trucks in Kings and Nassau Counties. (Kings County is coterminus with the borough of Brooklyn and Nassau County is adjacent to Greater New York on Long Island.)

The contract was arranged to be effective as of about Aug. 15, according to George Stowe of the New York Reo organization, and the details of putting it into effect are actively going forward.

Ford "Excellent Car," Dillinger Wrote Maker

A mead of praise for "making such an excellent car" was thrust upon Henry Ford from a surprising source —John Dillinger, before that notorious person became the victim of a Department of Justice bullet about a month ago. Dillinger, in a letter to Mr. Ford post marked "Minneapolis, May 16," said:

"I want to thank you for making such an excellent car. If I am ever captured it will have to be by someone in another Ford."

Ford officials first thought the letter a joke, but when it was turned over to officials of the Department of Justice the signature was pronounced genuine.

Durant Plant for Sale

Objecting to the increased assessment valuation placed on the former Durant plant by the City of Lansing, the owners, Houdaille-Hershey and Borg-Warner, have revealed that the plant is being offered for sale for $600,000.

Merger Rumors Spin Thick Web But Snare No Flies This Week

Stimulated bv the announcement of Pierce-Arrow plan to reorganize, which is regarded in some quarters as a step preliminary to its consolidation with some other manufacturer, merger reports flew thick and fast this week in the industry. Despite the high output of the rumor foundries, however, negotiations appear to be no nearer conclusion than two weeks ago.

Although R. E. Olds, Reo founder and board chairman, admitted that his company had been approached, he denied that any progress had been made or promise given, indicating further that there was little likelihood of Reo being involved in any merger at this time. Other manufacturers named in the rumors were mum.

Nevertheless it is known that financial interests are seeking to combine a considerable number of independent motor car companies but the shortness of time before the next selling season seems to be one of a number of stumbling blocks in the way of effecting these larger groupings.

Hudson was brought into the rumored Pierce-Arrow-Auburn negotiations this week, but so far no solid foundation for such reports seems to exist. Moreover, recurrent rumors that Hudson and Packard would team up do not appear to have

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Appending Maintenance To Dealer Code May Change Hour Provisions of Latter

WASHINGTON, Aug. 22—The maintenance code, which was rescued recently from the service section of NRA, and again given the status of an industry code, was destined to become a supplement to the motor vehicle retailing code today, as forecast in *Automotive Industries* last week.

It is understood that informal contacts of NRA with the code control committee of the dealers and the code committee of the maintenance industry have produced the approval of both groups.

The tentative plans for making the maintenance code a supplement of the dealer code now anticipate a separate code authority and a separate code administration budget for the maintenance industry. It is believed that the process of making the maintenance code supplementary to the motor vehicle retailing code can be accomplished without public hearing on the maintenance code provided the approval of the move, which is understood to have been unofficially obtained from both groups, can be made official through formal action of the respective committees.

The plan involves one major change in the motor vehicle retailing code concerning its labor provisions. The code at present provides a 44-hour week for mechanics and other employees, with a few minor exceptions. When the maintenance code becomes a supplement of the motor vehicle retailing code, it is probable that the labor provisions of both codes will be changed to limit the amount of work in any 24 hours with provision for the payment of time and a half to employees for hours of work beyond eight hours in any 24. Employers will also be required to pay time and a half beyond 44 hours a week. This provision of the code would standardize the labor provisions in all of the service stations in the United States, which include approximately 30,000 dealer service stations and more than 65,000 independent repair shops.

Fair trade practices in the maintenance supplement of the motor vehicle retailing code, it is understood, will be identical with those now in the dealer code.

Mechanics' Strike Off

Three hundred mechanics in the service departments of 25 Ohio Ford agencies have called off their month-old strike and are preparing to resume work Monday morning, according to Ralph A. Lind, secretary of the Cleveland Regional Labor Board, and A. L. Faulkner, federal labor conciliator.

C. O. Miniger

Auto-Lite Elects Martin President

Royce G. Martin has been elected president of Electric Auto-Lite Co. and Clement O. Miniger, for 20 years head of the company, was elevated to chairman of the board. Mr. Miniger will remain active in his new post, he said he had contemplated the change for some time, and that the new move will enable him to devote his attention to shaping general policies.

Mr. Martin is president of Moto Meter Gauge and Equipment Co., and was named vice-president of Auto-Lite last May when stockholders approved a plan to acquire Moto Meter. He will be in charge of operations not only in the main plant in Toledo, but in various subsidiary companies throughout the country.

It is believed that Mr. Martin's leadership of the company will bring into the fold of Auto-Lite customers some of the big manufacturers he has had as customers in Moto Meter.

D. H. Kelly will continue as vice-president and no other changes in directorate or official family were made.

Mr. Miniger went to Toledo 43 years ago as drug salesman and helped to start Auto-Lite in 1911. He is reputed to have extensive investments in scores of Toledo industries and large real estate holdings.

Regular quarterly dividend of $1.75 on preferred stock, payable Oct. 1 to holders of record Sept. 15 was declared. No action was taken on common shares.

Earnings of Auto-Lite and 21 wholly-owned subsidiaries were $827,448 for first half of 1934 or equal to 77 cents per share on common, before considering stock issued for Moto Meter, before federal taxes but after preferred dividend requirements. Compares with 19.1 cents a share in first half 1933 same basis.

Earnings do not include Auto-Lite's share in four other companies which it controls. These are Moto Meter, 94 per cent, or $346,238 earnings portion for first half; Columbus Auto Parts, 51 per cent, $20,585; Burt Foundry Co., 60 per cent deficit $458, and Barley Industries, Inc., 51 per cent $4,010, which total $370,376 earnings on equities.

Census Bureau Puts July Production At 277,689; 7 Mos. Total 4% Over '33

July production of motor vehicles in the United States and Canada according to the Census Bureau totaled 277,689, which is 3 per cent higher than the preliminary estimate made by *Automotive Industries* in its issue of August 4.

The July figure makes the total for the first seven months 2,074,112, which is 64 per cent above the corresponding period last year and exceeds the 1933 full year total of 1,985,981 by 4 per cent.

Passenger car output in July amounted to 232,275 units, a decline of 15 per cent from June but an increase of 18 per cent over last July. In the first seven months car output was 1,700,063, an increase of 69 per cent over the corresponding period last year.

Production of trucks amounted to 45,414 units in July, which was 8 per cent less than June, but 15 per cent ahead of July, 1933. The seven months' total of truck production was 374,049, as contrasted with only 199,394 in the same period last year, an increase of 88 per cent.

Of total July output, 266,575 units were produced in the United States and 11,114 in Canada.

The accompanying table gives the detailed production figures in comparative form:

Seven Months' Production 2,074,112

(U. S. & Canada Combined)

	July, 1934	June, 1934	July, 1933	Seven Months 1934	Seven Months 1933
Cars	232,275	272,662	196,587	1,700,063	1,064,879
Trucks	45,414	49,308	39,310	374,049	199,394
Total	277,689	321,970	235,897	2,074,112	1,264,273

Pierce Asks Court for Permission to Present Reorganization Program

Continued shrinkage of the demand for high-priced cars coupled with the adverse influence the dealer code has had on sales in that section of the market, caused the directors of the Pierce-Arrow Motor Co. this week to apply to the Federal court for permission to reorganize under the national bankruptcy law as amended by the last session of Congress.

Following presentation of the petition to the U. S. District Court, an order was issued setting the matter down for hearing on Sept. 17 and meanwhile continuing the present management in control.

In announcing the move, the company said in part: ". . . during the last five and a half years the company's share of the available fine car business has practically doubled. But, while this progress has been made and while the company is one of two in its competitive group to show increases in registrations this year over last, unfavorable business conditions have narrowed the total market for fine cars to a point where a reorganization of the company's affairs, including its manufacturing and merchandising program, is deemed necessary. The step now taken will pave the way for development and completion of plans intended to overcome the difficulties in the present situation. The company plans to continue its present line of fine cars, and it is expected that sales of these cars will be continued during reorganization procedure."

Although the reorganization announcement resulted in speculation in the daily press, apparently based on merger rumors which have been current in the trade for months, no merger has been effected although it is true that there have been numerous discussions of the subject involving different groups of companies. It is quite possible, however, that the reorganization now contemplated may prove a stepping stone to a merger.

The Pierce-Arrow company is one of the oldest in the industry, and has had a long and checkered career throughout which its products have enjoyed a high reputation for quality. In its recent history, its absorption by and divorce from Studebaker are perhaps the outstanding events. Studebaker secured control in 1928 and the present corporation was organized on Aug. 22 of that year. This relationship continued until last year when control was purchased from the Studebaker receivers by the present management and its backers. At that time, the corporate structure was simplified by the elimination of the preferred and classes A and B stocks and the substitution therefor of 750,000 shares of $5 common of which only 496,450 shares had been issued at the end of last year.

The net worth of the company as shown on a summary balance sheet as of July 31 was $6,029,090, with current assets of $2,431,533 against current liabilities of $2,025,795. Of the current debts, $1,250,000 are secured by assets of selling subsidiaries amounting to $1,484,224. A comparison of the summary with the Dec. 31, 1933, balance sheet follows:

	July 31, 1934	Dec. 31, 1933
Assets		
Cash and receivables	$ 660,600	$ 507,419
Inventories	1,770,933	1,607,689
Land, buildings and equipment	6,604,080	6,589,186
Investment and deferred charges, etc.	355,671	265,677
Good-will	1	1
Total assets	$9,391,285	$8,969,973
Liabilities		
Current liabilities	$2,025,795	$ 700,052
Notes payable due Jan., 1936	1,000,000	1,000,000
Real estate purchase mortgages	316,500	317,250
Reserve for contingencies	19,900	66,304
Net worth	6,029,090	6,886,366
Total liabilities	$9,391,285	$8,969,973

Some of the salient facts in the company's history during the last six years are presented in the following table:

Year	Vehicles Sold	Earnings (000 Omitted)	Working Capital (000 Omitted)	Cash (000 Omitted)
1933	2152*	D $1,044	$1,415	$243
1932	2241	D 3,032	1,493	448
1931	4324	D 477	4,092	674
1930	6922	1,317	5,359	1,296
1929	10347	2,566	4,240	827
1928	6491	D 1,293	4,692	2,781

* U. S. Registrations

The amended bankruptcy statute under which the company has moved is designed to facilitate reorganizations by providing protection against recalcitrant minorities. Since it is a relatively new law, a summary of some of its features is pertinent. It provides that a debtor corporation may petition the court for permission to present a plan of reorganization and, if permission is granted, no order of adjudication in bankruptcy may be entered. Such petition does not constitute an act of bankruptcy or an admission of insolvency, or is it admissible as evidence without consent of the debtor in any subsequent proceedings. If three or more creditors have provable claims of $1,000 or more in excess of any security held by them, or if stockholders owning five per cent or more of any class of stock outstanding are successful in controverting the facts alleged in the petition before the hearing is held (set for Sept. 17 in the case of Pierce-Arrow), the court has the power to dismiss the petition.

A. J. Chanter, Pierce-Arrow president, who plans reorganization

Plans of reorganization presented under the amendments shall include provisions modifying or altering the rights of creditors generally, or any class of them and may include provisions modifying or altering the rights of stockholders. The plan must provide for all administrative costs and allowances and, in cases where stockholders have an equity (i. e., solvent companies), must protect the equity of each class of stockholders of which less than a majority approves of the plan unless the judge rules that the interests of such stockholders are not affected adversely by the plan. Similar protection is provided for minority objectors to the plan among the creditors. The plan must also specify which claims are to be paid in cash in full and must provide adequate means for execution. Unsecured claims entitled to priority over mortgages retain their priority. The court is authorized to reject contracts of the debtor which are executory in whole or in part, including unexpired leases, but special provision is made for the protection of those who might be injured by the exercise of this authority. The court in its discretion may continue the debtor in the possession of his property or may order trustee control.

The court may not confirm a plan of reorganization until it has been approved by creditors holding two-thirds of the amount of the claims of each class which have been allowed and which would be affected. A majority of the stockholders of each affected class must also approve if the debtor is solvent. Reorganization plans must be proposed and accepted within a reasonable time, or the court may dismiss the petition. Minority creditors and/or stockholders may present alternative plans.

State Advisory Committees Baffled By Problems of Clean-Up Price Rule

How best to exercise the powers over clean-up prices granted to State Advisory Committees by the dealer code is causing members of such committees as well as local administrative agencies not a few headaches these days.

This week representatives of New Jersey, Maryland, West Virginia and Delaware met with Pennsylvania authorities in Philadelphia in an effort to bring order out of present chaotic conditions. Out of this meeting came a request to the National Control Committee of the Motor Vehicle Retail Trade for an answer to the question "What is a discontinued model?"

Other related questions which were discussed included: How long before a new model is announced can the previous model be declared obsolete and subject to sales at reduced prices? Can a manufacturer declare a single body model obsolete although other body models in the line are classed as current? The latter question arose out of the reported statement of one manufacturer that he had finished production on a certain body model, and it was suggested that this job be offered at more than $300 off, other models in the line to carry regular prices.

Another question of obvious importance is: should reductions allowed by State Advisory Committees be state-wide or should different cuts be permitted in various sections of the state depending on local conditions? Naturally, if there are large disparities between the reductions in the different areas, prospects will buy outside of their natural markets. On the other hand, stocks on hand in the different marketing territories may indicate large cuts in one area and small reductions in another. Cases also have arisen where two dealers handling the same line in a city disagreed on what should be done. One dealer had a stock which he felt he could sell at regular prices while the other was so overstocked that he regarded a price cut as essential.

Still another question which is bothering the trade is how the amount of the cut should be determined. In some eastern states, at least, a plebiscite of the dealers concerned probably will be resorted to for the answer to this one.

The problems presented by clean-ups are more than state-wide, however, and it was because of their interstate nature that the Philadelphia meeting was called. State lines are artificial divisions and seldom follow natural marketing lines. Consequently, the problem arises of reconciling conflicts between reductions allowed by one state and those permitted in adjacent states.

In the trade there is considerable opinion that the State Advisory Committees will have to establish the reductions on the basis of what it regards as best for the state as a whole even though this works injustice in some cases. There is no machinery provided in the code for settling interstate conflicts on this score and it may be necessary for the dealers to invent some procedure to take care of this difficulty.

The clean-up this year has aroused considerable resentment among dealers, as many of them feel that the tactics used in some cases have been designed to circumvent the code and at the same time to shoulder the retailer with the cost of the clearance. In fact, the feeling is quite strong that the best, if not the only way, to handle clean-ups is for the factories to announce a straight-out price cut. This, of course, would require rebates from the factory under many dealer contracts. It is to avoid such rebates, dealers contend, that some of the clean-up policies now in effect were adopted.

Pontiac to Operate Next Month; 7800 Units Added

The addition of several thousand more units to the production schedule will keep the Pontiac plants operating throughout September, according to a company announcement; 7,800 units having been added to the schedule at the request of the sales department.

Hudson Adds Built-In Trunk Sedans

Hudson Motor announced this week addition of sedan and coach models to its lines equipped with roomy built-in trunks. Prices follow:

	Terraplane Challenger	Special	Major
Coach	$575	$615	$680
Sedan	635	675	740

	Hudson Challenger	Special	DeLuxe
Coach	$705	$745	$835
Sedan	765	805	895

Airflow Imperial to Make Economy Trial

An Airflow Chrysler Imperial will attempt to set a new economy record between Los Angeles and New York under A.A.A. supervision during the latter part of the current month. The car will be driven by Harry Hartz. Engineering tests are said to have shown that the Imperial will give better than 16 miles per gal. under ordinary driving conditions and that with the overdrive, the fuel mileage is almost as great at 60 m.p.h. as at 20 m.p.h. without the overdrive.

Pontiac Field Day

Three hundred Pontiac dealers, salesmen and newspaper men from Southern California take part in an all day test of speed, economy and knee action riding on specially marked out courses on the dry bed of Muroc Lake. Speed made in 85 tests averaged from 85 to 93 miles an hour. Gasoline economy ran from 19 to 24 miles to the gallon at 30 to 45 m.p.h.

Ab Jenkins greeted as he emerges from Parley's canyon enroute to Utah's salt beds for his assault upon all world records up to 30,000 miles

Mid-Month Sales Indicate Pick-Up

Production Totals May Exceed Original Estimate; Heavy Sept. Cuts Likely

by Athel F. Denham

Detroit Editor, Automotive Industries

Some indications that August totals for automobile and truck production may be higher than originally contemplated, made their appearance this week. However, it is quite possible that the higher levels at which car makers are operating at present presage a more extensive curtailment of operations in September. At any rate, next month promises to get off to a slow start since virtually every major car producer will be closed down during the Labor Day week.

Retail sales picked up somewhat on some lines around mid-month following an earlier drop. At present, sales are running roughly 10 per cent under last month.

It is not expected that August will see a major reduction in dealer stocks which is a rather definite indication that new models will not be making their appearance for some time to come. As a matter of fact, most car manufacturers do not know even today just what they will be offering to the public in 1935 and are waiting for an inkling of what competition will have to offer before completing plans.

Buick on August 16 passed in retail sales its total for all of last year. Its total retail deliveries in the domestic market for the year to that date amounted to 43,274 units.

Plymouth retail deliveries for week ending August 18 totaled 7344 and shipments totaled 7649, a 30 per cent increase over the preceding week.

Dodge reports 1966 passenger cars sold at retail week ending August 18, compared with 1894 the preceding week. Dodge sales of 1111 were up some 214 over preceding week. Dodge truck sales on August 20 passed sales for entire year 1933 when 34,377 were sold.

Ab Jenkins Sets 24 Hr. Record at 127 M.P.H.

Ab Jenkins, driving a Pierce-Arrow special, set a new world's 24-hour record last Saturday when he drove 3053 miles on the Bonneville Salt Flats, Utah. His average speed was 127.208 miles per hour. He then set out to set a new record for 25,000 miles in 15 days, but was halted by mechanical trouble which could not be overcome in the time allowed under the AAA rules. He resumed his attempt on Sunday and is reported to have averaged 128 miles per hour for the first 1700 miles. The present 25,000 mile record is held by Studebaker and was hung up on the Atlantic City Speedway.

W-O Asks Court to OK Canadian Settlement

Parent and Dominion Cos. Severance Is Important Step in Reorganization

Settlement of all claims of the Willys-Overland, Ltd., and the Willys-Overland Sales Co., Ltd., of Canada, against the Willys-Overland Co., has been effected and placed before the federal court in Toledo for approval.

The parent company was guarantor on a note for $218,000 owed by the Canadian subsidiaries.

Judge George P. Hand, sitting in the U. S. District Court at Toledo, ordered all parties interested in this suit to file their objections to the granting of the order on or before last Thursday (Aug. 23) and set Friday (Aug. 24) as the date for hearing the application for the order or any objections to its being granted.

Under the terms of the settlement the company will be relieved of all liability under this arrangement, it will receive $25,000 in cash, acquire all sales rights to Willys-Overland products in Canada, and the Canadian company will retain the physical property of the plant in Toronto.

The Canadian Bank of Commerce represented banking interests in closing the deal for the Canadian interests.

Fraser, Hiett, Wall & Effler, attorneys for the reorganization committee, made the application for approval of the settlement in the court.

The parent company owned 72 per cent of the capital of Willys-Overland, Ltd., and 100 per cent of the stock of the sales company.

As We Go to Press

Briggs Mfg. Co. is reported planning an addition to one of its plants on the east side of Detroit.

* * *

Dow Chemical is delivering the first of its Dowmetal trailers, being produced at the former plant of Union Motor Truck Company, Bay City, Mich., this week. The plant is building some 10 trailers monthly.

* * *

Grand Rapids Plating Company has purchased the plant of the Michigan Wheel Company, Grand Rapids.

* * *

Charles E. Wade has resigned as vice-president and general manager, Lakey Foundry and Machine Company, Muskegon.

* * *

The pattern makers' strike, still in progress in Detroit, has resulted in sending quite a considerable amount of pattern work out of town. No attempts have been made by the labor association, affiliated with the A. F. of L., to call out pattern makers in automobile plants, although such a call was threatened at the beginning of the strike. A possibility exists that a settlement may be reached between workers and pattern shops toward the end of the current week.

* * *

Participation of the Ford interests in the 1935 New York Automobile Show which will be held in Grand Central Palace by the Automobile Merchants Association of New York, is "confidently expected" by William Colt, chairman of the show committee. Alfred Reeves, vice-president and general manager of the Automobile Manufacturers Association, has officially been "lent" to the association to manage the show.

Frisco Data Show Used Car Results

Losses Average Lower This Year Under Code

A little light on the effectiveness of the dealer code in reducing used-car losses in one of the nation's important cities is provided by statistics compiled monthly by the Motor Car Dealers Association of San Francisco.

These statistics indicate that reporting dealers sustained a gross loss on their used cars in every one of the first seven months of this year but that the losses in general were somewhat less than during the corresponding period last year until last month when the percentage of loss exceeded the 1933 figure for the first time. This exception, however, was due not to a flurry of wild trading this year but to an unusually small loss ratio in July, 1933, as the following table shows:

	Average Gross Loss per Used Car		Average Per Cent Loss on Sales Price	
	1934	1933	1934	1933
January	$ 80	$ 9	27.87%	3.29%
February	104	37	38.95	13.50
March	39	30	13.68	10.38
April	61	34	23.92	12.27
May	46	47	17.50	16.78
June	51	22	19.69	7.34
July	15	34	5.42	11.33

The improvement appears to be due largely to increased selling prices, although in the first four months of the year buying prices were lower than in the corresponding months last year. The following table gives the averages for the reporting dealers:

	Inventory Value		Selling Prices	
	1934	1933	1934	1933
January	$282	$367	$273	$287
February	311	371	274	267
March	319	324	289	285
April	311	316	277	255
May	327	309	280	263
June	321	310	299	259
July	334	292	300	277

It is interesting to note that inventory values trended downward last year during the period covered by the foregoing figures, while this year the general tendency has been upward. The general trend of selling prices follows the same pattern—up this year and down last.

Hudson Executives Hold Dealer Forums

Hudson executives journeyed to New England this week for four "dealer forums," a part of the series of meetings being held in distributing centers throughout the country in the wake of the Hudson Company's nation-wide challenge program. C. G. Abbott, general sales manager, and G. H. Pratt, assistant sales manager, will hold meetings in Portland, Me., Boston, Providence and Springfield, Mass., this week.

Next week, forums will be conducted in New York, Newark, Philadelphia, and Pittsburgh. During the past several days, W. R. Tracy, sales manager, and other Hudson officials have led similar meetings in Detroit, Indianapolis, Cincinnati, Saginaw, Toledo, Fort Wayne, Buffalo and other mid-western and eastern points.

Plymouth Now Offers Pile Fabric at No Extra Cost

Pile fabric upholstery, commonly called mohair, is now offered at no additional cost on Plymouth DeLuxe and Special Six cars. Formerly an extra charge of $5 was made for this material.

Lea Resigns from NRA

Col. Robert W. Lea has resigned as assistant administrator of NRA to become a commercial and financial consultant. He was one of the first aides selected by General Johnson when the latter undertook administration of the Recovery Act and was assigned to handle the automobile manufacturing code. He presided at the public hearing on this code and it continued under his supervision following its approval until he was given broader activities in NRA. General Johnson and Col. Lea were associated with each other in the Moline Plow Co. during the time that company produced the Stephens car.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

There was a moderate recession in general business activity last week. The steel industry was operating at the year's low level, and bituminous coal production fell below the level a year ago. Despite the hot, dry weather in many sections, retail and wholesale trade continued to improve.

Car Loadings Drop

Railway freight loadings during the week ended Aug. 11 totaled 602,530 cars, which marks a decrease of 8768 cars below those during the preceding week, a decrease of 27,213 cars below those a year ago, and an increase of 90,565 cars above those two years ago.

Retail Sales Down

The Federal Reserve Board's preliminary figures for department store sales during July show a greater than seasonal decrease. The adjusted index stood at 72, as against 74 for June and 77 for May.

Power Production Tops 1933

Production of electricity by the electric light and power industry in the United States during the week ended Aug. 11 was 1.9 per cent above that in the corresponding period last year.

Chain Stores Sales Increase

Sales of 23 store chains during July were 2.8 per cent above those in the corresponding period last year. Sales of two mail order houses were 13.44 per cent higher than those a year ago.

Food Prices Rising

Retail food prices during the two weeks ended July 31, according to the Bureau of Labor Statistics, increased by 0.5 per cent. The continued strengthening in retail food prices since the latter part of April has brought the current average up to 110.4 per cent of the 1913 level.

Oil Production Steady

Average daily crude oil production for the week ended Aug. 11 amounted to 2,506,850 barrels, as against 2,451,300 barrels for the preceding week and 2,789,600 barrels for a year ago.

Wholesale Prices Firm

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 18 stood at 77.8, as against 77.8 the week before and 77.9 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Aug. 15 showed an increase of $1,000,000 in holdings of discounted bills and an increase of $1,000,000 in holdings of government securities. Holdings of bills bought in the open market remained unchanged.

Steel Looks to 1935 Car Models for Boost

Institute Reports Ingot Production Continues To Fall; 21.3% of Capacity

Because of intermittent shut-downs of producing units that can be operated more efficiently under prevailing conditions when there is a certain accumulation of specifications, the steel industry's from-week-to-week statistical picture is hardly indicative of definite trends at this time. With several Ohio plants inactive, this week's rate of operations is placed by the American Iron and Steel Institute at 21.3 per cent of ingot capacity, compared with 22.3 per cent last week.

At the same time, however, an important Michigan producer resumed operations this week following a week's intermission, having virtually gone on a three weeks per month rate of operations pending development of buying on a larger scale by automotive consumers. At that, the Michigan producers, catering almost entirely to the needs of automotive plants, and operating three weeks out of four or its equivalent, present a far more cheering picture than do other steel-making districts. In the Cleveland market there is talk of further tonnages of body stock orders for 1935 models about to be placed. Chicago district mills attribute to odds and ends business from automotive consumers their ability to maintain operations this week at close to one-third of capacity.

Authoritative comment on newspaper reports to the effect that the Steel Code may be revoked because of displeasure with the interpretation of the collective bargaining provision has so far not been forthcoming. Neither are the leaders of the steel industry voicing any opinion as to whether they consider the intensified activities at the Ford open-hearth furnaces and the preparations for sheet rolling there as a possibly major market influence in the immediate future. With very little expectation of any real quickening of activity in the steel market until the middle of September, there is in evidence everywhere a disposition to watch developments between now and after Labor Day without attempting to formulate, even tentatively, price policies that the march of events may prove untenable.

Pig Iron—Fourth-quarter prices go into effect on Sept. 1. Until these are definitely determined, melters will continue to cover their immediate requirements with carload purchases. Automotive foundries, moreover, are well provided with iron over the next few weeks.

Aluminum—Quiet and steady.

Copper—Consumer demand is light. Blue Eagle copper moves in small tonnages at 9 cents, delivered Connecticut point. The "outside" market is nominally quoted at 8⅛ @ 8¼ cents. European buyers pay 7⅞ cents, c.i.f. Liverpool, Hamburg, or Havre.

Tin—Slightly higher prices for Sterling exchange caused the price of spot Straits tin to harden, the week's opening quotation being 52.20 cents.

Lead—Quiet and unchanged.

Zinc—Dull and easy.

Stanton Joins Autocar

Arthur T. Stanton, for eight years head of Stanton Motors, Inc., of Columbus, Ohio, one of the largest automobile distributorships in that state, has been appointed sales manager of the Studebaker division of the Autocar Company, according to an announcement by H. M. Coale, vice-president in charge of sales. Mr. Stanton will contact the Autocar branches and dealers who are selling Studebaker light truck in combination with the Autocar heavy-duty line.

Buick Dealer Set-Up Passes 2700 Mark

The Buick Motor Company will meet the fall selling season with one of the largest dealer organizations in its history, according to W. F. Hufstader, general sales manager.

Mr. Hufstader has announced that the dealer organization has passed the 2700 mark, has shown a gain of 490 since the first of the year, has shown a gain of 620 or 30 per cent since Aug. 1 last year and is 267 dealers larger than it was in 1929.

New Toncan Distributor

A recent addition to the organization of Toncan Iron distributors is Buhl Sons Co., Detroit, Mich., according to announcement by N. J. Clarke, vice-president in charge of sales, Republic Steel Corp., Youngstown, Ohio.

Ford Adding 110,000 KW Turbine to Plant

GE Building Second Big Generator for River Rouge Factory; First 4 Yrs. Old

The Ford Motor Company is to add to its River Rouge power generating plant, at Fordson, Mich., a General Electric 110,000-kilowatt turbine generator that will be even more efficient than the similar one which was placed in service in the same station in 1930. The previous unit will be the first large unit anywhere in the world to operate at 1200 pounds pressure and 900 degrees Fahrenheit. The Ford Company is also obtaining from the General Electric Company a 15,000-kilowatt non-condensing turbine for installation in the same station. It will furnish process steam to the Ford factory at 250 pounds pressure.

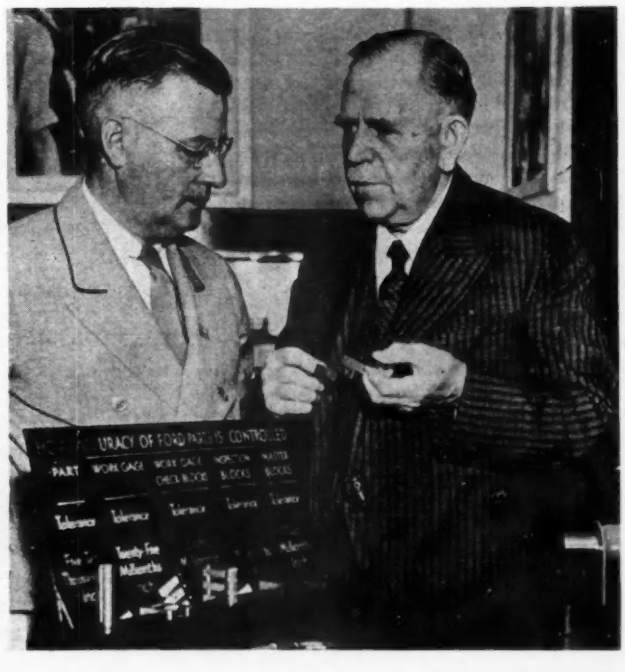
The cost of the installation, including also a 15,000-kilowatt turbo-generator, will be $5,500,000.

The new machine, like the first, is a vertical compound unit. The high-pressure turbine and generator will be mounted directly on top of the low-pressure turbine and generator. Each element has a capacity of 55,000 kilowatts, and generates at 1800 r.p.m.

As a result of using the high temperature, even less coal will be needed to produce a given electric output than in the case of its companion unit, which itself is notable for its high efficiency.

One of the important features of the vertical design—of particular value in the Ford plant, where floor space is at a premium—will be the small amount of space taken by the unit. The general dimensions will include a length of 57 feet 6 inches, a maximum width of 23 feet, and a little less than 21 feet over-all height from the floor.

Sees Own Gauges at Ford Exposition



C. E. Johansson, creator of Johansson precision gauges, some of which are accurate to one-millionth of an inch, inspects the display devoted to his gauges at the Ford Exposition of A Century of Progress. The Ford Motor Company has exclusive American manufacturing rights on these gauges

Restoration of Industrial Liberties Urged by DuPont, GM Chairman

Removal of the government's dominating supervision of business and industry, and the restoration to business and industry of the same rights and liberties enjoyed by the individual are urged by Lammot DuPont, chairman of the board of General Motors and president of the DuPont company, in a statement issued this week in which he takes issue with President Roosevelt over the latter's assertion that withdrawal of federal supervision would restore "the old law of tooth and the claw."

Illustrating his point, Mr. DuPont declares that an organization employing 10,000 men should be accorded the same treatment as an individual employing one man to perform the same duty. Mr. DuPont amplified this point by insisting that business or industry is simply an "aggregation of individuals to do something which a single individual can do, but far less efficiently and successfully."

A digest of Mr. DuPont's statement follows:

"It is interesting to speculate what is in a man's mind when he uses a striking phrase in a public speech. On Aug. 9 President Roosevelt made an address in which he referred to two letters from 'important men' pleading that he say something to restore confidence . . . one suggested that all supervision by all forms of government be abolished . . . the President declared that this meant that the 'old law of the tooth and the claw would reign once more.'

"I have many times speculated as to what the President had in mind when he used the phrase last quoted. Was he thinking of the 'cut throat' competition which was supposed to have existed before the NRA came into existence or was he taking the suggestion literally and harking back to the days of savagery when there was no government? . . . It hardly seems possible he was referring to the days before the NRA, when the 'cut throat' competition of 'big business' was supposed by some to have brought on the depression, had he not overlooked the fact that this competition was brought about by, if not compelled by, the Sherman law which, passed in the '90's, was supposed to create competition. . . . It would seem logical to conclude that the President must have been referring to the days before the enactment of the Sherman law. . . . Those must have been the days of the 'law of the tooth and the claw,' but it is interesting to note in passing that those days of the 80's and early 90's were the ones during which the laboring classes of Europe were migrating to the United States in the greatest numbers. I always thought they came over to get the freedom and advantages of this country. . . .

". . . Government regulation of business, as such, and as distinguished from other forms of activity, should be abolished. I mean that business should not be prohibited by government, or compelled by government to do things which private individuals are not prohibited or compelled to do. If I have a hole in my backyard and employ a man to dig coal out of it for my own use . . . why should I be allowed to treat him any better or any worse, or pay him any better or any less, than a coal company employing 10,000 men to do the same thing? . . . Business should be treated as an individual is treated—no better, no worse."

Lammot DuPont

Chevrolet Gets U.S. Army Contract for 750 Trucks

Major General Louis H. Bash, quartermaster general, has awarded a contract to the Chevrolet Motor Co. for 750 trucks, 1½-ton, light chassis, cargo body, at $501,970.78. These trucks are to be purchased for the Civilian Conservation Corps at an average cost of $669.29 per vehicle.

The detailed awards follow:

506 trucks @ $657.01, f.o.b., Flint, Michigan—$332,447.06.
45 trucks @ $677.56, f.o.b., Tarrytown, N. Y.—$30,489.75.
67 trucks @ $752.71, f.o.b., Oakland, Calif.—$50,431.57.
14 trucks @ $695.83, f.o.b., Kansas City, Mo.—$9,741.62.
118 trucks @ $668.31, f.o.b., Janesville, Wis.—$78,860.78.
Total—750—$501,970.78.

Seeks to Halt Shackno Act, NRA Enforcement

The first brief with particulars in the case of the Spielman Chevrolet Corp., New York, against District Attorney Dodge was to be filed Aug. 23, according to the attorneys for the plaintiff.

The suit, which was initiated Aug. 16, in the Supreme Court of New York, is designed to enjoin the district attorney from enforcing the provisions of the Shackno Act (New York's local legislation to reinforce the provisions of the NRA) so far as they apply to the motor-vehicle retailing code.

It will be alleged in the brief that the Shackno Act and the NRA legislation are unconstitutional, and therefore incapable of enforcement.

White Co. Employees Abandon Strike Plans

White Co. employees at a meeting Wednesday night unanimously voted to accept the company's proposals on seniority rights and working conditions ending all possibilities of a walk-out. Recently the men were voluntarily given a raise in hourly pay by the company and according to union officials are well satisfied in all respects. Several employees were laid off recently precipitating a controversy over seniority rights. The company showed that the men in question were laid off because they were single and did not have families to support. All points of controversy over these men were amicably settled.

Chevrolet Appoints English Distributor

An early evidence of prospective improvement in the export of American cars to Great Britain, as a result of a marked reduction in the horsepower tax to become effective Jan. 1, 1935, is to be seen in the announcement that a Chevrolet passenger car distributor has been appointed in England.

Now, for the first time in many years, active merchandising effort is to be put behind the Chevrolet in England as the result of the appointment of Messrs. Cass & Joyce, Ltd., a firm which handles also the Talbot and Sunbeam cars, as Chevrolet distributor. The firm will market the American cars through a dealer organization which comprises 150 outlets in England, Scotland, and Wales. In London, the Chevrolet showroom and main selling offices will be at 24-27 Orchard street, opposite Selfridge & Company, London department store.

Truck Selling Supplement Nearly Ready for NRA OK

A truck supplement to the dealer code, bringing the sale of motor vehicles of greater than 1¾ ton capacity under the control of the motor vehicle retailing code authority, was expected to be ready for presentation at a formal NRA public hearing in about 10 days. The supplement anticipates the compilation of a used truck price guide covering heavy-duty vehicles similar to the N.A.D.A. Official Guide now in operation.

Auburn Does 20 m.p.g.

A stock Auburn Phaeton Six sedan is reported to have recently made the run from Miami to Chicago, via Pennsylvania and New York, a distance of 3113 miles, on 155 gallons of gasoline. The average fuel consumption for the trip was 20.08 miles per gal.

Inflated Financing Hit by Chrysler Explanation

Striking at inflated financing charges, Chrysler Motors this week featured a formula showing car buyers how to figure instalment costs including insurance. The formula follows:

Check Cost This Way:

1. Write here the amount your dealer asks as down payment (this may include trade-in value of an old car) $.....
2. Write here the total of all monthly payments required. $.....
3. Add the two figures above. Their sum is the total cost of car including financing and insurance. $.....
4. Write here the cash delivered price of the car. $.....
5. Subtract amount No. 4 from amount No. 3 above. The result is the total cost of financing, including insurance.* $.....

Then—compare this cost with the finance cost under the Official Chrysler Motors Commercial Credit Plan, and *pay no more* for the financing of your car purchase.

**Fire—Theft—Collision.*

H. W. Tinker Named General Manager of Warner Brake

Herbert W. Tinker, for several years chief engineer and factory manager of the Federal Pressed Steel Co., Milwaukee, has accepted appointment as general manager of the Warner Electric Brake Mfg., Beloit, Wis. He was associated with the Federal concern nearly 20 years. The Warner company was recently reorganized and in addition to continuing manufacture of its line of electric braking systems for trailers, will make similar systems for passenger cars, trucks, motorbusses, etc.

Refinancing Plan Up to Murray Stockholders

Murray Corporation stockholders are to consider on August 29 a refinancing and exchange plan under which unissued stock would be exchanged for $1,750,000 of 6½ per cent mortgage bonds due Dec. 1.

Hercules Adds Diesel 6

Hercules Motors has added a six-cylinder, 4⅜ x 5¼ in. engine to its line of Diesels. The new powerplant is stated to develop 120 hp. at 2000 r.p.m. and to have a maximum torque of 340 ft. lbs. The company announces that a smaller size engine will be ready soon.

Deering Joins Z-K

Ray Deering, one time president of Stevens-Duryea and formerly vice-president and general manager of Continental Motors subsidiary, Continental Aircraft Engine Corporation, has joined Zimmer-Keller, Inc., of Detroit, in an executive capacity.

Dealer Code Changes

NRA has taken no formal action on amendments being formulated to the Motor Vehicle Retail Trade Code covering title and possession, fleet discounts and consignments. Approval of budgets submitted by state and national code authorities is expected within the next week.

Rytecraft "Scoota-Cars" developed and manufactured by J. W. Shillan, appear in England

NRA Reorganization Plans Rumor Bound

Perkins, Johnson Break Reported; Say Richberg Has Coordination Scheme

NRA reorganization plans are rumor bound and apparently no one in Washington seems to know exactly what is to be done, or when. President Roosevelt's departure from the capital for the Rainey funeral appeared to be the signal for loosing an avalanche of rumors concerning the future policies and direction of the Recovery Administration.

One rumor puts Secretary of Labor Perkins and General Johnson in the arena prepared to duel to the finish over their individual ideas on future policies of NRA. Another rumor, persistent for two or three weeks, puts Donald Richberg, former NRA counsel, at the head of a reorganized NRA. Mr. Richberg presented a factual report on New Deal activities at a conference of Cabinet members and other government officials in the White House this week, and the reports emanating from that conference are that a three-fold program for the coordination of all the administration's emergency and regular activities.

Still another rumor puts the President and General Johnson in accord on NRA's future with a proposed reorganization of this division along what is described semi-military lines by dividing the administrative element into five "sectors" or divisions with a board of five men, who would be known as assistant administrators supervising the administration. General Johnson would continue, according to this rumored plan, to direct NRA with the board functioning under him in purely supervisory capacities.

Baldwin and Strachan Form New Ad Agency

William M. Baldwin, director of advertising and sales development, and Kenneth Strachan, assistant general sales manager of the Pierce-Arrow Motor Car Company, have resigned to form a new advertising agency. The firm will be known as Baldwin & Strachan, Inc., and its offices will be located in the Huyler Building in Buffalo.

Nat. Motor Buys Building

The National Motor Bearing Company of San Francisco has acquired the factory building in Oakland formerly occupied by the Pacific Coast Division of Victor-R.C.A. Corporation. The company expects to occupy its new quarters about October 1 after extensive alterations are made. The building is a two-story structure providing 60,000 sq. ft. of floor space.

The Horizons of E

THE strikes are all due to a "misunderstanding" of 7a—by the employers. As soon as they can be enlightened regarding the true meaning of labor's NRA prerogatives the current epidemic of strikes, again rising to a crescendo, will abate. At least this is the opinion of Frances Perkins, our Secretary of Labor, who presumably should know something about labor and its chronic disaffection. This cabinet member, whose speech and manners are coated with New England frost, is an undeviating and honest liberal. Her convictions have not been affected by the scorn of the conservative or the disapproval of the professional labor leader. She believes a thirty-hour week practicable in industry and is much more interested in adequate wage standards than in the profit margins which make employment opportunities and pay envelopes possible. Neither her analysis of current labor unrest nor her optimism regarding an early solution is shared by the majority of labor students. She vouchsafes no interpretation of the language of 7a which might dissolve the ignorance of the employer and promote that industrial peace which, she avers, is within such easy reach.

Cures Which Do Not Last

The fact is that the skirmishes between capital and labor have increased in frequency, intensity and scope within recent months. There was a temporary subsidence after the general strike on the Pacific Coast. The struggle is resumed once more in all its original bitterness in the textile industry. Although the Department of Labor and the National Labor Relations Board have performed yeoman service in the composition of disputes, the solutions have not stuck. Regional labor boards have been working on the west coast, in Minneapolis, Detroit, Pittsburgh, Toledo, Washington, Birmingham and other cities for months without making an appreciable impression upon the underlying causes of labor strife.

The Growth of Class Consciousness

These conflicts, unquestionably one of the major reasons for the failure of business to make progress, are at present changing in character. Where formerly they were narrow contests involving the specific rights of the worker in his particular job, they have latterly assumed the aspects of a class struggle. Norman Thomas appears as a principal spokesman at a meeting of the United Textile Workers who decided upon a strike of all employees in the cotton, woolen, silk and rayon industries. According to the census of 1931, there were 6,111 plants in these four fields employing 887,000 workers. It is hardly conceivable that all these employers have maltreated their workers, refused to discuss their grievances and conditions of employment, or exploited them unfairly.

Collective bargaining refers to the right of a group of employees to bargain as a unit with their employer. It does not mean a class struggle covering an entire region and every type of employer and worker, as on the west coast, or a vast group of related industries embracing at the outside three-quarters of a million workers, as is the case in the textile field. The resolution of the U. T. W. in favor of a labor party and the industrial, instead of the craft, form of union organization, points unmistakably toward a class struggle and a bid for power, politically and by coercion within industries, as serious as any experience which this country has had since the Knights of Labor.

The prospects for an early solution may best be judged by examining first the inadequacy of present treatment and secondly isolating the germ organism responsible for the current outbreak.

Peace by Supplication

The various bodies appointed to effect peace are simply official supplicants delegated to beseech the two parties to stop quarreling. There was much ado about the power to arbitrate disputes granted in the closing days of Congress to the National Labor Relations Board. Arbitration is the authority to adjudicate a dispute and force acceptance of the decision upon the two parties provided they agree in advance to abide by the decision. The sanction for enforcement must come entirely from the power of the pledge which each side grants. This purely moral force can not be subjected to excessive strain, so that the decision if and when reached is usually a delicately balanced compromise which satisfies neither side and is often merely a truce pending preparation for another struggle.

An apt illustration is provided by the U. T. W. which threatened a strike early in the summer when the Textile Code authority cut machine hours from 80 to 60 per week. Since this reduced each shift from 40 to 30 hours, it resulted in a pay cut of 25 per cent. The textile workers were willing to accept the cut in

Business

by Joseph Stagg Lawrence

hours but not in pay, on the ground that the employers had welched on their code agreements and had turned out more goods than they were permitted. The "solution" by which this threatened strike was "averted" consisted of an investigation of the charges by a committee on which the workers were represented, together with an examination of the ability of the employers to pay 40-hour wages for 30 hours of work. The vote of the U. T. W. to go on the warpath shows how lasting this solution proved.

Ex-Parte Judicial Bodies

A difficulty with many adjustment boards is that they are heavily loaded with labor representatives. Employers are reluctant to place themselves at the mercy of an allegedly judicial body, most of whose members are as open-minded toward the employer as a Nazi tribunal toward the Jews. It likewise results in the attempted imposition of arbitral conditions which already contain the concessions for which labor is battling. In the longshoremen's strike on the coast, the conditions of arbitration offered the employer contained the control of the hiring halls by the union; in Minneapolis, they contained minimum wages far above those then prevailing. In effect, these labor tribunals said to the employer, "If you will grant the demands of labor, we will arbitrate the remaining issues."

One-Way Industrial Justice

Insofar as these boards have any clubs they are wielded entirely upon the employer who strays from the path of compliance. The denial or abrogation of government contracts at a time when such contracts form a substantial part of all business activity is a form of pressure difficult to resist. Failing this, the NRA symbol can be taken away. The Harriman case is outstanding but certainly not isolated. In a single day, the National Labor Relations Board asked for the removal of the blue eagle from the Wheeler Shipyards in New York, the C. F. Smith Co. in Detroit, and the Foster Knitting Company in Burlington, N. C. There is no record of any action taken against unions, even when their activities resulted in a complete negation of state authority, the destruction of property, and the loss of lives. Thus, the National Labor Relations Board, the various regional boards and the conciliation efforts of the Department of Labor constitute extremely frail and strictly one-way industrial justice.

The Matrix of Strife

On the other side, we have the virus of strife which is becoming more malignant with the passing months. The most aggravating circumstance is section 7A. This clause was written by the A. F. of L., and is deliberately designed to tie the hands of the employer while organizers step in and consolidate trade unionism. It seems to deny the employer any form of influence over his workers while leaving organized labor free to intimidate and coerce reluctant employees who cannot see the wisdom or value of trade union membership. The resistance of employers to the application of labor's interpretation of this clause has perhaps been the most fertile single provocation of strikes. Here again civil authority has virtually abdicated and granted the strikers not only the right to a concerted cessation of work but the license to prevent others from working, to destroy the property of the recalcitrant employer and crack the skull of the obdurate worker.

There is a subtle and perhaps unintentional incitement of labor in the attitude of the Administration toward business and finance. The constant references to the "money changers," to the tooth-and-claw methods of enterprise, to the predatory practices of business men, to the exploitation of the forgotten man, have been fuel for the fire of the class struggle. This vilification of employers as a class has bestowed an official accolade upon the efforts of the labor leader.

Trade Union Leadership Dares Not Stop

Finally, we have the inability of trade unionism to find a stopping place. The Government, through the codes, has established maximum hours, minimum pay, and aided the supply position of labor by eliminating child labor. If the Government provides this, why pay $15 a year to a trade union? The labor leader, to justify his position, must strive for more than the fair standards which the Government has created. Furthermore, his efforts must never cease. A given concession is a *fait accompli* for which the worker is unwilling to pay continuous future tribute. He will do this only if there is a prospect, kept reasonably alive, that he will continue to gain. This carries with it the closed shop, the check-off, promotion by seniority, unemployment insurance, old-age pensions (both serviced out of corporate income) and ultimately a controlling voice in management.

Makers Consider Code Renewal

(*Continued from page* 213)

Elimination of the merit clause at this time would, in the minds of most executives, be evidence of defeat on one of the most important principles for which they have fought and would make subsequent handling of labor situations extremely difficult. Should NRA officials reverse their ruling on this particular point, there can be little doubt that extension of the code would be possible only after the most serious opposition from the industry.

No enthusiasm can be found among factory executives either for extension of the manufacturers' code to include fair trade practice provisions, paralleling or complimenting those included in the retail code.

Probably only by incorporating in an approved NRA code a provision which would prohibit one manufacturer from taking on a dealer whose contract had been cancelled by another manufacturer for a retail code violation could such action be made legal. It is scarcely conceivable that manufacturers will ask for any such provision yet, short of some such move, manufacturers can scarcely put themselves in the position of being able effectively to help police the retail code. All of which means, to most observers, that the manufacturers probably never will assume any important role in enforcing the provisions of the retail code.

All officers and directors of the association were reelected for the coming year, it being the fifth term for Alvan Macauley, president of the association.

A joint meeting of the Automobile Manufacturers Association and the National Automobile Dealers Association is scheduled for tomorrow to discuss questions in connection with the truck code.

Merger Rumors

(*Continued from page* 213)

any factual basis, particularly in view of the extensive program the latter company has for putting across its new car in the medium-priced field.

In connection with merger reports involving Pierce-Arrow, Chrysler is named in press reports as having considered absorption of Pierce-Arrow and there is reason to believe Chrysler has given some thought to the proposition, although whether it is still doing so is another question.

At one time or another during the week, Nash, Hupp and Graham also have been mentioned in the avalanche of merger rumors.

Mergers in the parts field also are being discussed and perhaps promoted. The year-old report that a deal between Chrysler and Electric Auto-Lite was under discussion, incidentally cropped up again this week in connection with the announcement of the election of Royce C. Martin as the president of the latter company succeeding C. O. Miniger, who was elected chairman of the board.

Graham-Paige Assigns Thoms to New England

Lansing W. Thoms, for the last six years vice-president and sales manager of the Graham-Paige Company of Michigan, Inc., has been appointed Boston district manager in charge of the New England territory of Graham-Paige Motors Corporation, according to A. I. Philip, vice-president and general sales manager.

R. A. Green will continue in the New England territory where he has been identified with the sale of Graham cars for many years.

GM Reassigns Wallace

E. S. Wallace, formerly manager of Bay City Chevrolet plant, has been appointed general manager of the Saginaw Steering Gear Division, with offices at Saginaw, Mich., according to an announcement by F. O. Tanner, G.M. staff director of manufacturing. M. L. Hillmer, retiring general manager, will, after a short vacation, be assigned to other duties.

E. S. Wellock, manager at Atlanta for the past six months, has been named to succeed Mr. Wallace at the Bay City plant.

Motor Products Corp.

For the six months ended June 30 the Motor Products Corp. reports a net profit of $206,323 after taxes and charges, as compared with $48,608 for the corresponding first half of last year. Earnings this year are equal to $1.05 per common share of no par.

Chrysler Gets Exemption on Code Hours Provisions

The Chrysler Corporation has been granted an exemption from the hours provision of the Automobile Manufacturing Code. The exemption, which covers 44 die sinkers and 25 toolmakers employed at the corporation's Newcastle, Ind., plant, followed action by NRA on an application made by the National Automobile Chamber of Commerce.

The text of the exemption follows:

"That forty-four (44) die sinkers and twenty-five (25) toolmakers employed by said Chrysler Corporation at Newcastle, Ind., shall be permitted to work not more than forty-two (42) hours per week for a period of three (3) weeks commencing June 15, 1934, provided that the average time worked by the employees hereby exempted shall not exceed thirty-five (35) hours per week for the full period of the life of this Code."

Report Studebaker Record

A new transcontinental speed record is reported to have been made between Halifax, N. S., and Vancouver, B. C., by a Studebaker Dictator St. Regis Sedan, with Bob McKenzie at the wheel. The car traveled 4284 miles between these two widely-separated points in a total elapsed time of 84 hours and 22 minutes for an average of 50.78 miles per hour, according to the Studebaker Corp.

Accounting System O.K'd

The uniform system of cost accounting provided for in the Motor Fire Apparatus Code has been formulated and approved by NRA, the current issue of *The Blue Eagle* reveals.

CALENDAR OF COMING EVENTS

SHOWS

American Transit Assoc., Cleveland, Ohio ..... Sept. 22-27
Cleveland (Automotive Service Industries) ..... Nov. 19-23
New York Automobile Show.... Jan. 5-12
Chicago Automobile Show.... Jan. 26-Feb. 2

MEETINGS

American Chemical Society, Cleveland, Ohio ..... Sept. 10-14
American Welding Society, New York City ..... Oct. 1-5

ANNUAL MEETINGS

Natl. Assoc. of Motor Bus Operators, Cleveland ..... Sept. 21-22
Natl. Safety Council, Cleveland, O.. Oct. 1-5
Institute of Traffic Engineers, Cleveland ..... Oct. 2-3
S.A.E. Annual Production Meeting Detroit ..... Oct. 10-11

CONVENTIONS

American Society for Metals, New York City ..... Oct. 1-5
American Transit Assoc., Cleveland ..... Sept. 24-27
International Foundry Congress, Philadelphia ..... Oct. 22-26
American Foundrymen's Assoc., Philadelphia ..... Oct. 22-26
National Foreign Trade Council, New York ..... Oct. 31-Nov. 2

EXPOSITION

Natl. Exposition of Power & Mechanical Engineering (Biennial) New York, N. Y. ..... Dec. 3-8

FOREIGN SHOWS

Paris Automobile Salon..... Oct. 4-14
London International Automobile Show ..... Oct. 11-20

JUST AMONG OURSELVES

Majority Rule in Parts Plants?

IF in settling any automotive parts company case the National Labor Board should decree that representatives elected by a majority group of workers must be accepted as spokesmen for the entire group, it will have set up a principle directly opposed to that incorporated in the settlement negotiated by President Roosevelt with the automobile industry itself which specifically provides for minority as well as majority representation for employees.

The old Wagner labor board did rule in favor of majority representation in several instances, thus creating an anomalous situation which, it is to be hoped, will not again be presented to industry. A fight on just this point is taking place now due to a ruling of the Steel Industry Labor Board.

* * *

Human Dealings by Human People

THE principle of majority rule in worker-employee relationships, eliminating as it does the right of minority groups or individual workers to deal directly with the management, seems to us contrary to those principles of operation in industrial relationships on which permanent peace in industry is likely to be built. It places industrial relationships too definitely in the realm of those things to be dealt with by political strategy and economic struggle as against human dealings between human people.

Some will maintain that this is exactly where industrial relationships must rest, if there is to be any chance of justice for the individual worker—and they will not be without evidence to support their case. But we don't think any such point has been reached in America as a whole. High hopes for constructive relationships between management and individual workers seem justified when perhaps the most important executive in the automotive industry can be found saying in private conversation—as he did to us only the other day:

"Much of our trouble has been that, beginning with the War, we got to thinking of men in masses. We got to thinking of them as mobs to be herded about here and there. Too much of that spirit carried over into industry afterwards.

"We must get back to thinking of men as individuals—as people—as human beings. And then we must deal with them as such. If we don't we will simply be storing up more trouble for ourselves."

* * *

Automobiles in 1968

THE coming of independent wheel suspension last year has opened the minds of more executives than ever before to all sorts of unusual suspension possibilities. While 1935 probably will see only additional independent springing of different types, even more radically different suspensions are getting at least passing attention from the commercially minded at the factories.

It is usual to think of new constructions in terms of their possible application to a car something like last year's model. Gradually, however, the point is being reached where possibilities for improvement may sometimes warrant a totally new conception of what a piece of comfortable, individual transportation might be. We think that the automobile of 1968 will exhibit greater differences from that of 1934 than does the 1934 Oldsmobile from the 1900 Oldsmobile shown in a recent publicity picture.

* * *

Negotiations on, But No Merger Yet

DESPITE positive statements in at least one other trade publication, it is **not** true that a merger has been negotiated between Pierce-Arrow and Auburn. It is true, on the other hand, that several different sets of negotiations involving several groups of companies have taken place. If they keep rubbing the sticks together long enough, sparks may actually begin to fly and some sort of combination might take fire.

You don't have to be an insider nor the Seventh Son of a Seventh Son to figure out why plenty of rubbing is necessary before the fire starts. Agreement on the proper sized chunk for each participant in proposed new corporate pies; agreeable alignment of personalities; general agreement about lines of product to be exploited; determination of how productive facilities may best be utilized—these and a score of other no less pertinent matters have to be settled rather definitely before action is likely.

The days of the quick merger, the run-up of new stocks on the exchange, the turning of a quick profit for the promoters with the active management and the public left to carry on permanently as best they might—those days are gone, if not forever, at least as far as the eye can see. Present-day mergers and reorganizations are harder to make than they would have been back in the good old days—but once made they are far more likely to mean something in the future automotive picture.—N. G. S.

Corrosive Action of Carbonic A to Be the Major Cause of (

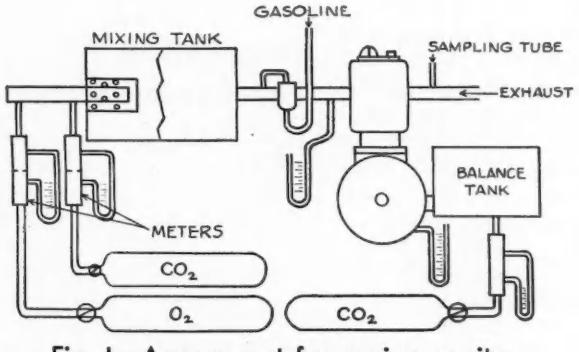


Fig. 1—Arrangement for running on nitrogen-free atmosphere

A FURTHER report on the subject of cylinder wear has been issued by the research and standardization committee of the Institution of Automobile Engineers. It deals specifically with experiments undertaken to determine which of the acids that may be formed in the cylinders of internal-combustion engines under certain conditions are responsible for an appreciable amount of wear. Effects of top cylinder lubrication on the wear of cylinder walls and top rings were also investigated. The report is by C. G. Williams.

The first report of the committee on this particular subject, which appeared in March of last year, had for its principal conclusion that accelerated wear occurs at low engine temperatures and that this is attributable to corrosion resulting from the deposition on the cylinder walls of acid-bearing moisture. The reasons for assuming corrosion to be responsible may be recapitulated as follows:

(1) The pitted and discolored appearance of piston rings and cylinder walls after low temperature operation;
(2) The fact that increased wear begins just below the calculated dewpoint;
(3) The detection of acids in the water of combustion;
(4) The large reduction in wear obtained with hydrogen fuel;
(5) The reduction in wear obtained when using corrosion-resisting materials.

It was pointed out that the acids responsible for corrosion might be any or all of the following:

(a) Nitric acid: oxygen and nitrogen may combine during the explosion to form nitric oxide, further oxidation producing nitrogen peroxide, which, in the presence of water, forms nitric acid;
(b) Organic acids, such as formic, may be produced as an intermediate product in the combustion of hydrocarbon fuels;
(c) Sulfuric acid results from the combustion of sulfur in the presence of water;
(d) Carbonic acid results from the solution of CO_2 in water.

It should be noted that, with the exception of organic acids, all the foregoing require the presence of liquid water for their formation and cannot, therefore, be formed above the dewpoint, i.e., when the cylinder walls are sufficiently warm.

It was decided to study the influence, if any, of nitric acid by running an engine on an "atmosphere" free from nitrogen, so that the possibility of forming nitric acid was excluded. A mixture of 33 per cent oxygen with 67 per cent carbon dioxide was used, the latter serving as a diluent to replace the nitrogen. It was necessary, on the score of expense, to operate the engine at the comparatively low load of 26 lb. per sq. in b.m.e.p. Engine speed was 1100 r.p.m. and cylinder-wall temperature 122 deg. F. Oxygen and carbon dioxide were fed from cylinders through orifice meters to

THE experimental work dealt with in this article indicates that cylinder-wall and piston-ring corrosion (which manifests itself as wear of these parts) is to a very considerable extent due to carbonic acid formed by the solution of carbon dioxide, a product of combustion, in water condensed from the products of combustion, and that the effect increases as the temperature of the engine decreases. The usual sulfur content of standard gasolines causes little corrosion, but a high sulfur content should be avoided nevertheless. Corrosive effects of nitric acid and organic acids could not be definitely proven, but the results indicate that a certain small amount of wear is due to these acids.

Top cylinder lubrication resulted in no reduction in cylinder-wall and top-ring wear so long as the total consumption of lubricant was kept the same, but the wear was materially reduced when considerable quantities of lubricant were fed to the inlet manifold on starting the engine from cold.

Acid Found Cylinder Wear

Tests indicate top cylinder lubrication reduces cylinder wear only at the expense of an increase in total oil consumption

a mixing tank, and thence to the inlet pipe.

To prevent leakage of air into the cylinder, the engine was operated at full throttle, the necessary throttling being effected by reducing the valve lift by the use of excessive tappet clearance. In addition, it was arranged to feed the atmosphere to the inlet pipe at such a rate that there was always a positive pressure in the pipe, so any leakage would be from inside out instead of in the opposite direction. Besides, an atmosphere of carbon dioxide was maintained in the crankcase by putting the breather valve out of action and connecting the crankcase to a 26-cu. ft. tank, to which carbon dioxide was fed at a pressure of about 2 in. of mercury. In this way the nitrogen in the exhaust was reduced to 1/3 per cent. Fig. 1 shows the experimental arrangement.

All the trial runs, however, gave unmistakable signs that this method of running an engine would certainly not result in the reduction in cylinder wear to be expected if the formation of nitric acid were the predominant factor. In fact, in every case a large increase in cylinder and piston-ring wear was recorded.

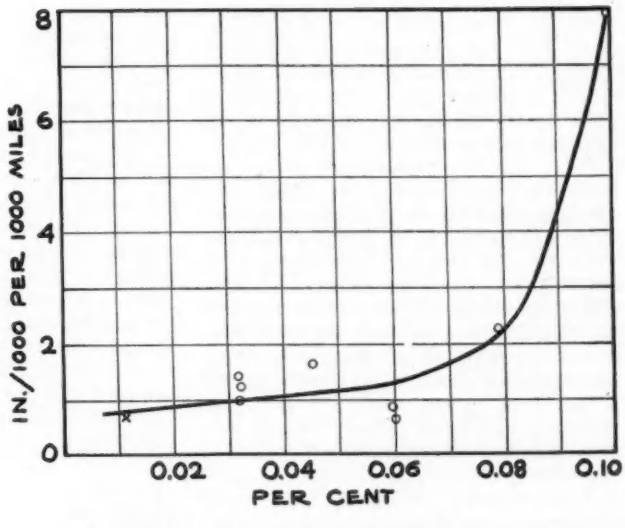
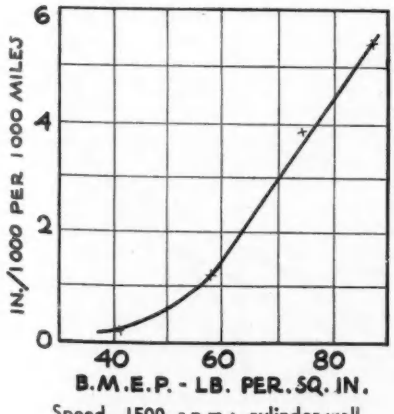


Fig. 3—Cylinder wear in relation to sulfur content

Speed, 1500 r.p.m.; b.m.e.p., 75 lb. per sq. in.; cylinder-wall temp., 122 deg. F.



Speed, 1500 r.p.m.; cylinder-wall temperature, 122 deg. F.

Fig. 2—Effect of load on wear at low operating temperature

The following table shows typical values of cylinder and top piston-ring wear obtained on a low-nitrogen atmosphere and on ordinary air:

Atmosphere	Wear, in. —per 1000 miles— Top Ring	Cylinder
Air	0.0099	0.00058
Low N_2 (CO_2 diluent)	0.056	0.0078

These figures indicate that this method of operation had introduced a corrosion-accelerating factor which had completely swamped any possible reduction due to the elimination of nitric acid. It was conjectured that this factor was the presence of large quantities of CO_2 in the exhaust gases, about 90 per cent, as compared with the usual 10 to 15 per cent.

To determine more directly whether CO_2 has a corrosive action at low-cylinder-wall temperatures, the rate of wear was determined first when hydrogen was used as fuel so that the products of combustion, although containing large quantities of water, were completely free from CO_2. Wear was then determined under the same conditions of engine load and cylinder-wall temperature with the exception that 15 per cent of CO_2 was added to the intake air, so that the exhaust gases now contained water and CO_2. Finally a check run was carried out under normal running conditions, using gasoline, though still under the same load and low-temperature operating conditions. The following table records the rate of wear of the top piston ring in each of these three series of tests:

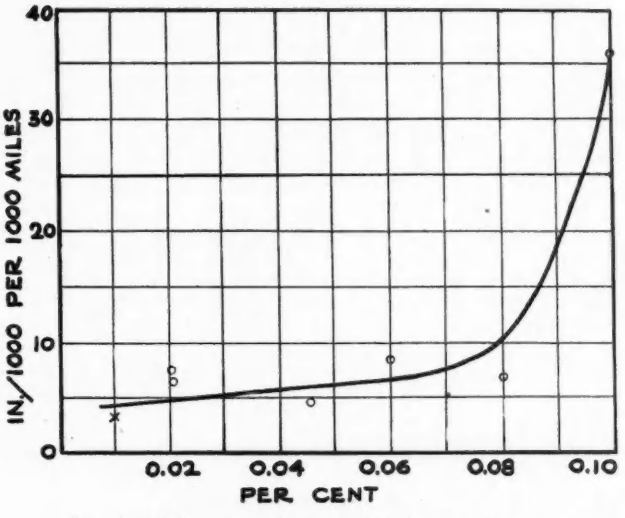


Fig. 4 — Piston-ring wear in relation to sulfur content

Speed, 1500 r.p.m.; b.m.e.p., 75 lb. per sq. in.; cylinder-wall temp., 122 deg. F.

	Top-ring Wear, in. per 1000 miles
H_2 + air	0.0015
H_2 + air containing 15% CO_2	0.0040
Petrol + air	0.0125

1100 r.p.m., 26 lb. per sq. in. b.m.e.p., cylinder wall temperature 113 deg. F.

It will be observed that the addition of CO_2 increased the rate of wear appreciably. The rate of wear did not, however, rise to the value obtained when running on gasoline, suggesting that the action of the CO_2 was not responsible for the whole of the wear obtained with gasoline. The piston and lubricating oil remained remarkably clean during the runs on hydrogen only, but with the addition of CO_2 the piston became covered with a brownish paste suggestive of ferric oxide.

The corrosive action of CO_2 in the presence of moisture was further confirmed on another engine which was motored at a speed of 1100 r.p.m. The rate of wear was first determined when the atmosphere supplied to the engine consisted of hot air containing 16 per cent by volume of superheated steam, and then when 15 per cent CO_2 had been added to this mixture. The cylinder wall temperature of 95 deg. F. resulted in considerable condensation on the walls, with consequent corrosion, and the results, summarized in the following table, indicate a very large increase in rate of "wear" due to the presence of CO_2:

Atmosphere	Top-ring wear in. per 1000 miles
Air + steam	0.00073
Air + steam + CO_2	0.040

These figures do not agree quantitatively with those obtained under actual running conditions, partly because of the much greater condensation of water on the cylinder walls which occurred in the motoring tests, but they certainly confirm the important influence of CO_2 in conjunction with moisture as a cause of cylinder corrosion at low operating temperatures.

It is well known that an aqueous solution of carbon dioxide contains carbon acid, H_2CO_3. Under atmospheric conditions this acid is very weak, but the solubility of carbon dioxide in water increases almost in proportion to the pressure. Thus, at a pressure of 440 lb. per sq. in. the amount of gas dissolved is more than 20 times that dissolved at atmospheric pressure. Hähnel (Inorg. & Theor. Chem., Mellor, Vol VI) found that at a pressure of 760 lb. per sq. in. and a temperature of 60 deg. F. the strength of carbonic acid is about equal to that of formic acid. It is also interesting to note that the solubility of CO_2 falls off rapidly with increase in temperature, a fact which would help to explain the accelerated corrosion which occurs as cylinder wall temperature is decreased.

As the solubility of CO_2 increases with pressure, a corresponding increase in cylinder-wall corrosion would be anticipated. An attempt was made to study this effect by varying the compression ratio of an engine which was motored on an "atmosphere" of air, steam, and CO_2. The attempt to carry out prolonged series of experiments over a wide range of pressures had to be abandoned, as the cylinder walls and piston rings appeared to acquire a certain degree of immunity from corrosion, possibly owing to the formation of some protective film. By making use, however, of the initial readings obtained in these experiments it was possible to construct a graph which shows a linear increase in the rate of top-ring wear from 0.017 in. per 1000 miles at 25 lb. per sq. in. to 0.053 in. per 1000 miles at 125 lb. per sq. in. maximum pressure.

In order to confirm the foregoing result on an engine run under its own power, an engine was operated at 1500 r.p.m. and at various loads ranging from 41 to 88 lb. per sq. in. b.m.e.p., the cooling-water temperature being varied in order to maintain a constant cylinder-wall temperature of 122 deg. F. The results, plotted in Fig. 2, show a marked increase in rate of wear with b.m.e.p. It does not necessarily follow that a low load is preferable to a high load when warming up an engine; in fact, the reverse is true, since the increased cylinder wear resulting from a heavier load is more than offset by the beneficial effect of the shortening of the warming-up period.

It is not suggested that this increase in wear with load is due entirely to increased solubility of the CO_2, as the more vigorous scraping action of the piston rings with increase in the pressure behind them, by removing detritus and any protective film, tends to accelerate the wear.

In order to study the possible importance of sulfuric acid formed from the combustion of sulfur in the fuel, it was decided to carry out a series of tests on fuels containing various amounts of sulfur.

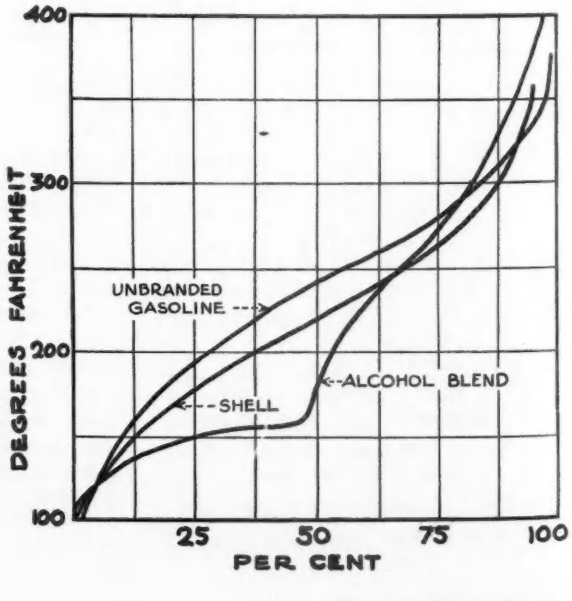
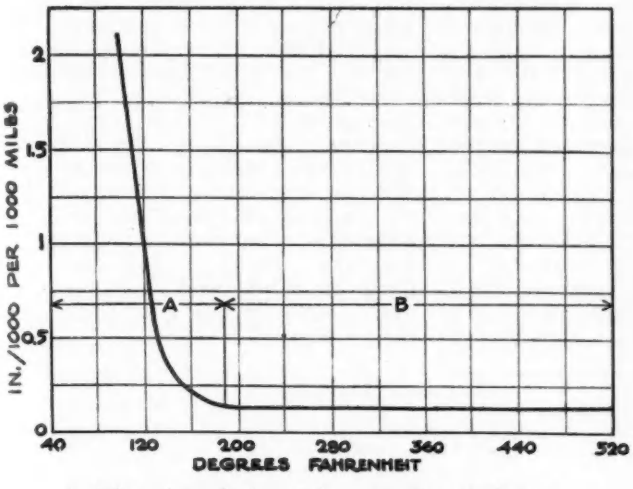


Fig. 5 — Distillation curves of test fuels



A—Wear dependent on oil consumption; B—Wear very largely independent on oil consumption

Fig. 6—Relation of cylinder wear to oil consumption

In tests dealt with in the previous report, carried out at a cylinder-wall temperature of 122 deg. F., by increasing the sulfur content of a fuel from 0.03 to 0.20 per cent, cylinder wear and top-ring wear were increased nine-fold and six-fold respectively. A sulfur content of 0.20 per cent is very high, of course, and to determine to what extent the more usual sulfur content of 0.03 per cent is responsible for cylinder wear at low temperatures, tests were carried out with (a) an aromatic-free gasoline containing approximately 0.009 per cent of sulfur and (b) a No. 1 spirit containing from 0.005 to 0.009 per cent of sulfur.

Tests were made on an engine operated at 1100 r.p.m., a b.m.e.p. of 26 lb. per sq. in., and a cylinder-wall temperature of 122 deg. F. The results are summarized in the following table, each figure representing the average of at least three separate tests:

Fuel	Approximate Sulfur Per Cent	Wear, in. per 1000 miles — Cylinder	Top Piston Ring
Shell	0.030	0.00023	0.00153
Aromatic-free	0.009	0.00026	0.00115
Special low-sulfur No. 1 spirit	0.005 to 0.009	0.00025	0.00055

It will be seen that the cylinder-wear figures agree within the limits of experimental error, which were somewhat higher than usual, owing to the short duration of the runs. The piston-ring figures tend to show, however, a lower rate of wear with the low-sulfur fuels.

An objection to the foregoing tests is that they were not carried out with the same basic fuel, i.e., the fuels probably differed in certain respects, other than sulfur content, which may have affected the results. Further tests were therefore carried out in which the sulfur content of Shell gasoline was increased by the addition of ethyl sulfide, which probably represents the most important sulfur-bearing compound in gasolines. Results of tests carried out at a b.m.e.p. of 75 lb. per sq. in. and with a cylinder-wall temperature of 122 deg. F. are plotted in Figs. 3 and 4. The increase in the wear of the cylinder wall and top ring with sulfur content was relatively small up to a sulfur content of 0.08 per cent, but there was a rapid increase in wear for a sulfur content of 0.1 per cent. Experimental points obtained with the special low-sulfur fuel are indicated in these figures by crosses.

The foregoing results therefore indicate that the sulfur content of high-grade gasoline does not have an important influence on cylinder wear at low temperatures, but that sulfur contents of 0.1 per cent or higher have a marked effect in accelerating such wear.

Organic acids, such as formic and acetic, result from the oxidation of alcohols, so that it would be anticipated that the addition of alcohol to a fuel would tend to cause higher cylinder corrosion at low operating temperatures.

Experiments were carried out on a fuel containing approximately 17 per cent of ethyl alcohol, together with comparative runs under the same low-temperature conditions on Shell gasoline. The tests on the alcohol blend were "bracketed" between two series of tests on gasoline and the results are given in the following table:

Fuel	Wear, in. per 1000 miles — Cylinder	Top Piston Ring
Gasoline	0.00044	0.0027
Alcohol Blend	0.00080	0.0052
Gasoline	0.00045	0.0024

b.m.e.p. 59 lb. per sq. in., cylinder wall temperature 122 deg. F., 1600 r.p.m.

It will be observed that the cylinder wear under these conditions was 80 per cent greater, and the top piston ring wear 100 per cent greater, with the alcohol blend than with the ordinary gasoline.

Samples of condensate from the exhaust gases were collected and the total acidity measured. It was found that the total acidity of the condensate obtained when running on the alcohol blend was 1.27 mg. of KOH, while on gasoline it was 0.415 mg. of KOH. This large difference in acidity, and in cylinder wear, can hardly be attributable to difference in sulfur content of the fuels, as the sulfur content of the alcohol blend was not high, viz., 0.05 per cent.

The foregoing results emphasize the necessity for rapid warming up when alcohol blends are used, and appear to indicate that the greater wear obtained at low operating temperatures is due to the action of organic acids.

Comparative tests were carried out on gasoline and on the alcohol blend in an engine operating at a fairly high cylinder-wall temperature, viz., 338 deg. F., and the results are shown in the following table:

Fuel	Wear of Top Piston Ring in. per 1000 miles
Gasoline	0.00033
Alcohol Blend	0.00032

Air-cooled engine, at 1600 r.p.m., 66 lb. per sq. in. b.m.e.p., cylinder-wall temperature 338 deg. F.

It will be seen that the piston ring wear at high operating temperatures was the same on the two fuels, a result which would be expected if corrosion no longer plays a part at such temperatures. Owing to the low rate of wear in these tests it was not possible to obtain an accurate figure for cylinder wear, but its value was between 0.00006 and 0.00010 in. per 1000 miles for both fuels.

Wear measurements were made on engines running at both low and normal operating temperatures on an unbranded fuel of which a distillation curve is

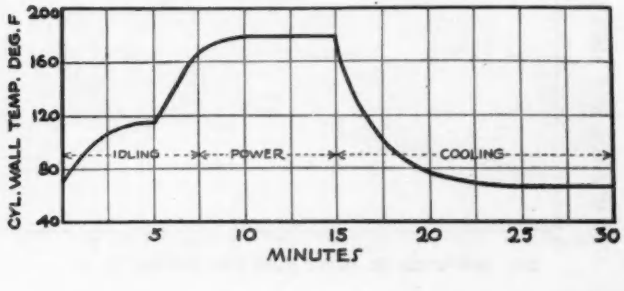


Fig. 7—Cylinder-temperature cycle used in wear tests

shown in Fig. 5 and which sold at about 5c. per U. S. gallon less than Shell gasoline. It will be observed that the unbranded gasoline was less volatile than the Shell and the alcohol blend, of which distillation curves are also shown in Fig. 5.

The results of tests carried out at low operating temperatures are given in the accompanying table, which shows that the unbranded gasoline gave 25-33 per cent greater wear than Shell.

	Wear, in. per 1000 miles	
	Cylinder	Top Piston Ring
Unbranded gasoline	0.00055	0.0036
Shell gasoline	0.00044	0.0027

Cylinder wall temperature, 122 deg. F., b.m.e.p. 59 lb. per sq. in., 1600 r.p.m.

The higher wear with the unbranded gasoline may be connected with its lower volatility, as the sulfur content was quite normal, but further experiments are being carried out to determine the effect of volatility.

The results of tests carried out at high operating temperatures are given in the following table, and show the same piston ring wear for the two fuels:

	Wear of Top Piston Ring in. per 1000 miles
Unbranded gasoline	0.00032
Shell gasoline	0.00033

Air-cooled engine, cylinder wall temperature, 338 deg. F., b.m.e.p. 66 lb. per sq. in., 1600 r.p.m.

As with the alcohol blend, tests were not sufficiently prolonged to permit an accurate determination of cylinder wear, but its value was between 0.00006 and 0.00009 in. for both fuels.

A graph showing the relation between wear and cylinder wall temperature is reproduced in Fig. 6 from the previous report. The accelerated wear at low temperatures has been shown to be very largely due to corrosion, but it remains to determine whether corrosion is at all responsible for the approximately constant rate of wear observed above a certain temperature. In this connection it will be recalled that nitric, sulfuric and carbonic acids all require the presence of moisture for their formation and can, therefore, be excluded from consideration at temperatures above the dew point. In order to study whether organic acids have any corrosive influence at high wall temperatures, the rate of wear was determined on an engine operated on hydrogen fuel, as this fuel precludes the possibility of forming any organic acids. The tests were carried out on an air-cooled engine at a cylinder wall temperature of 338 deg. F., which was well above the dew-point. On account of the expense of running on hydrogen, it was not possible to run sufficiently long to determine cylinder wear with any degree of accuracy, but the following table gives the results of measurements of wear of the top piston ring, when running on hydrogen and on gasoline under the same engine conditions.

Fuel	Top Ring Wear in. per 1000 miles
Hydrogen	0.00027
Gasoline	0.00029

Cylinder wall temperature 338 deg. F. 1200 r.p.m., b.m.e.p. 28 lb. per sq. in.

It can be concluded from the above figures that organic acids do not cause any corrosion at high cylinder temperatures. The most probable cause of this wear would appear to be abrasion, and the various factors determining its magnitude are at present under investigation.

Referring to Fig. 6, it will be noted that at normal operating temperatures cylinder wear is very largely independent of oil consumption, so that it would be anticipated that the small amount of lubricant which can be introduced in the form of an upper cylinder lubricant could hardly have much effect in reducing wear. This was confirmed by tests carried out on an engine operated under rather severe conditions, the lubrication from the crankcase being restricted in order that any possible improvement due to an upper cylinder lubricant might be made more apparent. The tests were carried out on a water-cooled engine at a speed of 2800 r.p.m., a cylinder wall temperature of the order of 300 deg. F., and a b.m.e.p. of 88 lb. per sq. in. The supply of oil to the big-end bearing was cut down to 20 c.c. per hr., the corresponding oil consumption being approximately 10 c.c. per hr., which would be about 16,000 m.p.g. Two series of tests were carried out, in one of which 0.25 per cent spindle oil was added to the gasoline, this being the customary proportion. The results given in the following table show that, within the limits of experimental error, no reduction in wear was obtained by the addition of the upper cylinder lubricant:

Lubrication		Wear, in. per 1000 miles	
Crankcase	Upper Cylinder	Cylinder	Top Piston Ring
20 c.c. per hr.	None	0.00035	0.00105
20 c.c. per hr.	0.25 per cent in gasoline =14 c.c. per hr.	0.00038	0.00110

Again referring to Fig. 6, it will be observed that cylinder wear at low operating temperatures is sensitive to oil consumption, so that there would appear to be better prospects of upper cylinder lubrication proving beneficial under these conditions.

Tests were carried out on an engine operated at low temperatures, and the table (top next page) shows the wear obtained with a restricted oil supply to the big-end bearing of 100 c.c. per hr., the corresponding oil consumption being 7 c.c. per hr. By adding 2.2 per cent of crankcase lubricant (Mobiloil B.B.) to the gasoline the rate of wear was reduced, as shown, in the approximate ratio of 3 : 1. The price paid for this reduction in wear was an increase in oil consumption of 39 c.c. per hr. in the form of an upper cylinder lubricant, making a total of 46 c.c. per hr. This same total oil consumption could, of course, be obtained by dispensing with upper cylinder lubrication and increasing the oil supply to the cylinder walls from the crankcase. This, in fact, was done by increasing the oil supply to the big-end bearing to 1300 c.c. per hr. and, as shown in the table, the rate of wear was reduced to that obtained with upper cylinder lubrication. In other words, the reduction in wear resulting from the use of the upper cylinder lubricant could be obtained, for the same total oil consumption, by improving the normal lubrication of the cylinder.

Even a content of upper cylinder lubricant as high as 2.2 per cent cannot always be relied upon to effect a reduction in wear at low temperatures. The above tests were carried out on a worn engine and at a wall temperature of 113 deg. F.; other tests on a new engine at a wall temperature of 122 deg. F. failed to show any consistent reduction in wear up to 3 per cent of oil in the gasoline.

Consideration of the foregoing would appear to indicate that the field for upper cylinder lubrication, if any, is in relation to starting from cold, particularly if arrangements can be made to add temporarily a high percentage of oil to the intake, provided this can be

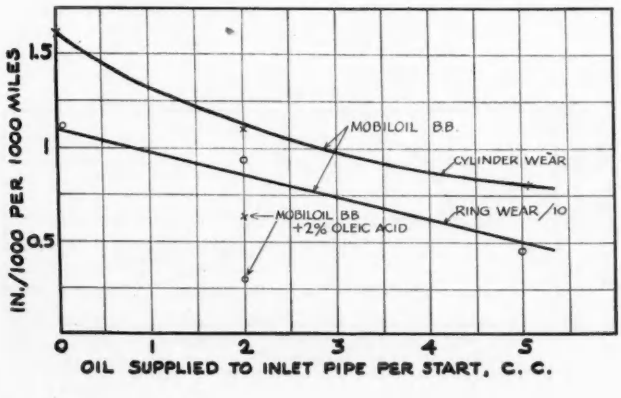


Fig. 8—Cylinder and ring wear in short-run tests

Oil Supply to big-end c.c. per hour	Oil Consumption, c.c. per hr. of crankcase lubricant	of upper cylinder lubricant	Total	Wear, in. per 1000 miles Cylinder	Ring
100	7	.....	7	0.00124	0.0096
100	7	39 (2.2 % in gasoline)	46	0.00048	0.0030
1300	46	.....	46	0.00052	0.0030

Cylinder temperature 113 deg. F., b.m.e.p. 59 lb. per sq. in., 1600 r.p.m.

done without interfering with carburetion or ignition. In this way the lubricant is consumed only when it is most likely to be effective. In order to study possibilities in this direction, several series of stopping and starting tests were carried out, each cycle involving a preliminary idle of 5 mins. duration followed by 10 mins. at 1500 r.p.m. under power, the engine then being allowed to cool for 15 mins., when the engine was restarted and the same cycle repeated, and so on. Fig. 7 shows the cycle of cylinder-wall temperature measured, as usual, at the top of the ring track. Owing to the delayed warming-up with this method of operation, the rate of cylinder wear was high, particularly as lubrication was also reduced, and 20 or 30 cycles were sufficient to permit a fairly accurate determination of cylinder and piston ring wear. The effect of adding various "doses" of lubricant was determined with the aid of a measuring burette connected to the intake close to the carburetor, the desired quantity of lubricant being admitted by controlling the fall in level with the burette tap. Quantities up to 3 c.c. per start were admitted just before the engine was started and were therefore washed into the cylinder by the fuel; higher amounts were inclined to cause misfiring if supplied entirely in this manner, so a portion was allowed to enter for about 10 secs. after the engine had actually started.

The following table gives the results of some tests in the order in which they were carried out:

Amount of lubricant added per start, c.c.	Wear in 1000 m. Cylinder	Per Top ring
O	0.0080	0.0328
2 c.c. Mobiloil B.B.	0.0017	0.0131
2 c.c. Mobiloil B.B.	0.0020	0.0117
O	0.0085	0.0380
2 c.c. Spindle Oil	0.0023	0.0142

The tests were carried out on a new engine and this fact, in conjunction with the delayed warming-up and restricted lubrication, accounts for the exceptionally high rate of wear of 0.008 in. per 1000 miles observed when no upper cylinder lubricant was supplied. A "dose" of 2 c.c. Mobiloil B.B. per start reduced cylinder wear in the ratio of 4 : 1, and top ring wear in the ratio of 3 : 1. The improvement was not quite so great when spindle oil was used instead of Mobiloil B.B.

Further stopping and starting tests were carried out on the same engine after it had been thoroughly run-in, and the results are shown in Fig. 8. It will be observed that the cylinder wear with no upper cylinder lubrication was now 0.0016 in. per 1000 miles which, though high, was much lower than that observed on the new engine. The reduction in wear obtained by the addition of 2 c.c. Mobiloil B.B. per start was of the order of 25 per cent which, though appreciable, was a very much smaller reduction than that obtained on the new engine. By increasing the "dose" to 5 c.c., the reduction in wear was increased to 50 per cent.

Fig. 8 also shows experimental points obtained when the "doses" of Mobiloil B.B. contained 2 per cent oleic acid. It was shown in the previous report that the addition of 2 per cent oleic acid to a mineral crankcase lubricant reduced cylinder wear at low temperatures, and the same effect was observed in the present tests, the improvement following the addition of the oleic acid to the upper cylinder lubricant being very appreciable.

It is not claimed that the above tests exhaust the subject of upper cylinder lubrication. In fact, further tests are contemplated.

Alfa-Romeo Racing Power Plant Has Central Flywheel

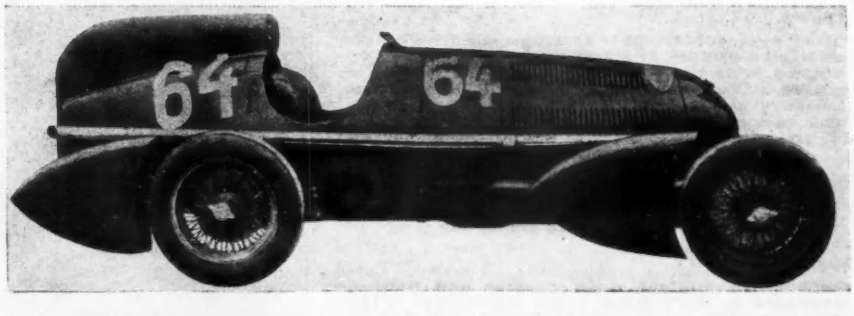
Following are some data on modern European racing cars taken from a recent issue of *ATZ*.

The engine of the 165-cu. in. Alfa Romeo consists of two blocks of four cylinders with the flywheel arranged between them, at the center, where the drive for the two overhead camshafts is also located. The crankshaft is supported in 10 bearings, is divided in the center and bolted into the flywheel. Each cylinder block has its own Roots blower and its own carburetor. The supercharge amounts to 0.8 atms., the compression ratio is 6.5. Ethylized gasoline is used as fuel and 1 per cent top lubrication is used, mainly on account of the superchargers (this probably means that oil is added to the fuel in the proportion of 1 per cent). The engine develops 200 hp. at 5500 r.p.m., which corresponds to a b.m.e.p. of 187.5 lb. per sq. in. and a specific output of 1.21 hp. per cu. in. displacement.

For road races and for tracks with numerous turns, a rear axle ratio of 3.77 is used, which gives a road speed of practically 120 m.p.h. at 5000 r.p.m. and a maximum speed of 140 m.p.h. The fastest round with an Alfa Romeo in the Avus (track) race was driven by Moll, at an average of 140 m.p.h.

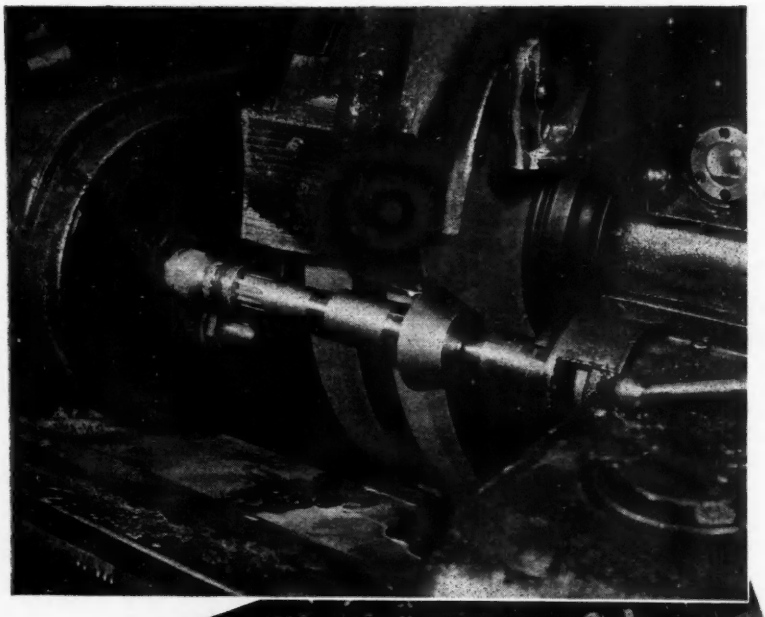
Rear-wheel drive is effected by means of two propeller shafts arranged at an angle to the axis of the car, each driving one of the rear wheels. These permit of a very low driver's seat and save about 15 lb. in weight as compared with a single central shaft.

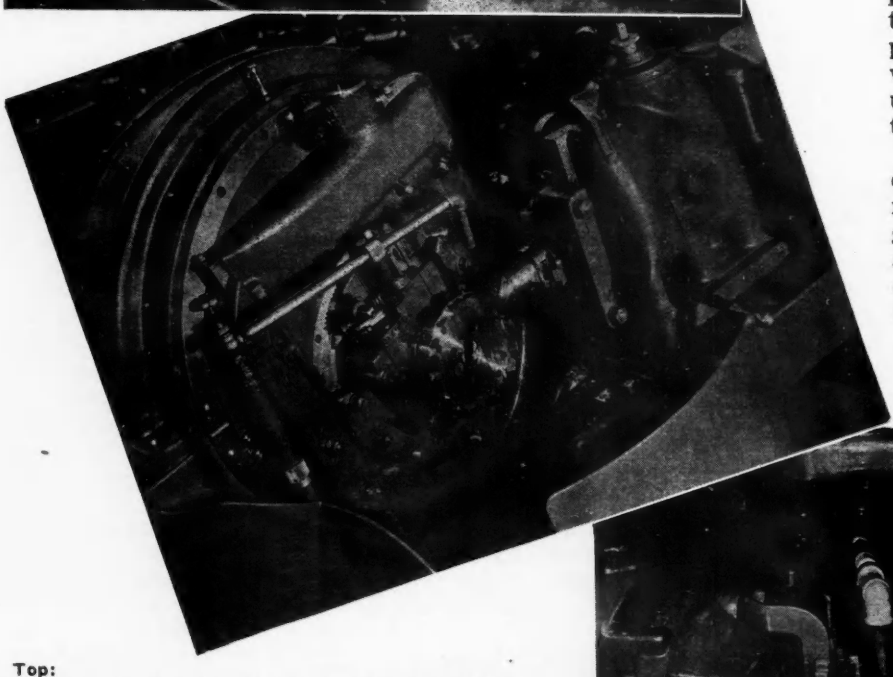
The 165-cu. in. engine of the P car (evidently the Auto Union racer designed by Porsche is meant) has 16 cylinders arranged V fashion, with a single camshaft between the two cylinder banks, which actuates the 32 valves through the intermediary of rocker levers. The crankshaft is the built-up Hirth shaft, with roller bearings in the Roots blower. The fastest round of the Avus track was made by Stuck during practice, at an average speed of 151 m.p.h.

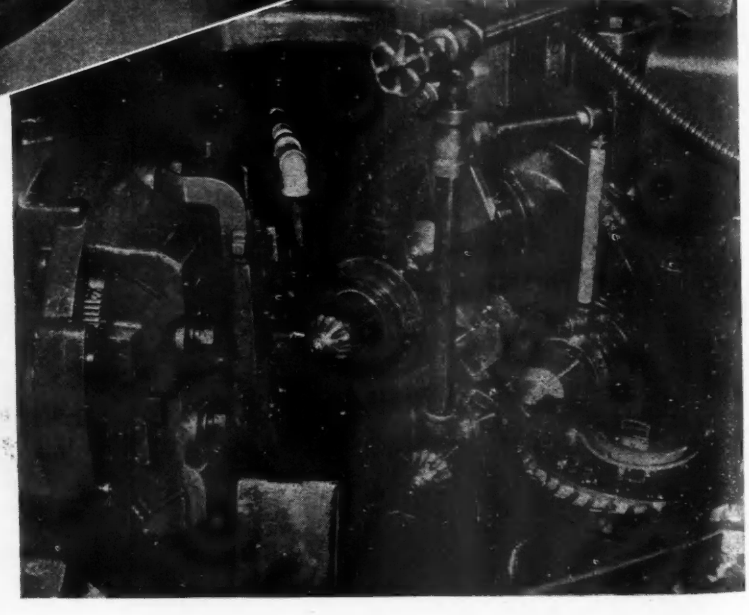


The new Alfa-Romeo racer with separate drive-shaft to each rear wheel and stabilizing fan

New Equipment Helping to Cut Cost and Improve







ROW upon row of gear-building equipment arranged with almost military precision meets the eye in the Chevrolet gear and axle plant, Detroit. Here is one of the great parts plants of the industry tooled to produce the entire output of ring gears, pinions and differential gears for Chevrolet passenger and commercial car axles.

While this array of manufacturing equipment naturally is most impressive, the most significant thing, so far as this writer is concerned, was the presence here and there in many sections of the plant of new gear-cutting machines, some of which still are in the experimental stage. Here is an outstanding example of the spirit pervading the progressive elements of the automotive industry—a program of improvement without which the forward march of the automobile undoubtedly would be seriously retarded.

This movement in the gear-producing industry is particularly significant because the specialized gear-cutting machines, like presses, are extremely rugged and capable of long life. And, like presses, are not often replaced. In fact, there

Top:
Grinding stem bearings of passenger car drive pinion on Norton grinder. Formerly this job was done on a speed lathe to a tolerance of 0.002 in. Now it is ground, using two wheels of different diameter, to a tolerance of 0.0005 in. Production is lower—75 per hour as compared with 200 per hour—but the finish is better and the bearing fit improved beyond comparison

Center:
Here is the new type No. 16 Gleason generator in the drive pinion line

Right:
Combination straight tooth rougher and finisher mentioned in the article. Index mechanism is inoperative while blank is being loaded. An electric lamp above the paddle glows when the paddle is back in its normal position and operating contact is made

by Joseph Geschelin
Engineering Editor, Automotive Industries

Quality of Chevrolet Gears

are many plants operating with gear-manufacturing machines ten and fifteen years old, perhaps in good mechanical condition, but just as surely obsolete. On this count Chevrolet certainly is setting a shining example.

Of gear-cutting equipment the Chevrolet plant boasts the following inventory of the principal machines:

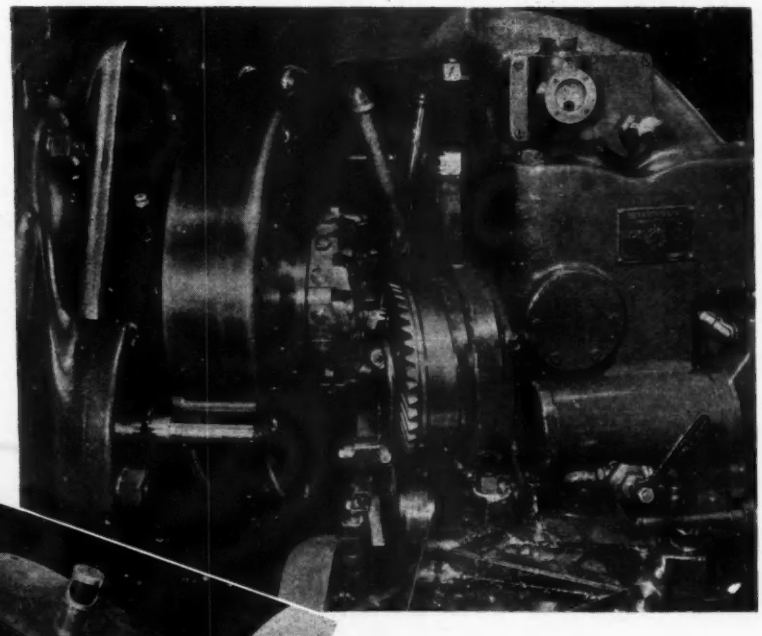
259—15-in. Gleason generators
32—10-in. Gleason generators
66—Spiral gear roughers
45—Spiral pinion roughers

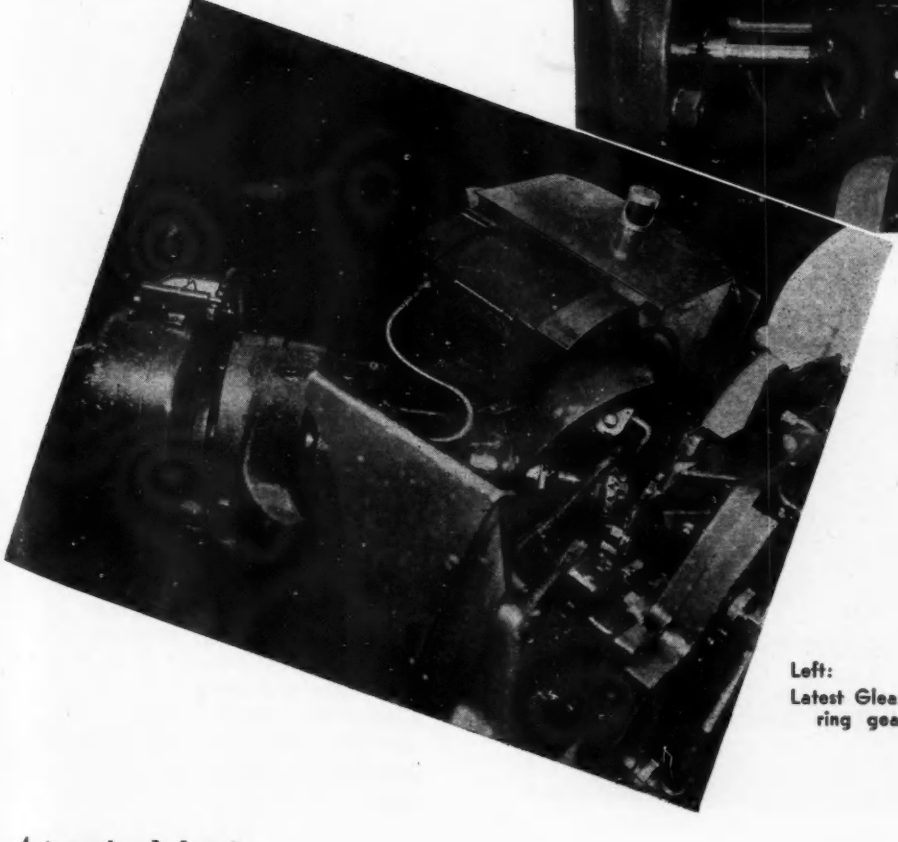
Naturally this does not include an array of vertical lathes, miscellaneous metal-cutting equipment, heat-treating equipment, and the great variety of inspection equipment upon which the quality of the product depends.

In the interest of brevity, perhaps the way of showing the activity in this plant is to follow the routing, at least of the principal steps, in the production of several parts. Here, for example, is the course of the spiral drive pinion:

1. Mill to length.
2. Center both ends.
3. Rough and finish turn stem (Bullard operation).
4. Rough and finish turn head (Bullard operation).
5. Mill spline on shaft.
6. Finish grind bearing dimensions.
7. Stamp (part number and Chevrolet emblem).
8. Drill pin-hole for coupling.
9. Burr pin-hole and spline.
10. Thread for lock nut.
11. Check bearings (inspection 100 per cent) to tolerance of 0.0005 in.
12. Rough cut teeth (Gleason 15-in. rougher).
13. Finish cut teeth (Gleason 15-in. generator).
14. Try out pinion for proper tooth bearing (100 per cent—Gleason

(*Turn to page 236, please*)





Top:
Angle shot of a new eight-inch Gleason manufacturing straight tooth generator producing a differential side gear

Left:
Latest Gleason No. 10 roughing a 37-tooth ring gear—operation fully automatic

The Forum

Validity of Image Method of Air-Resistance Measurement Questioned

Editor AUTOMOTIVE INDUSTRIES:

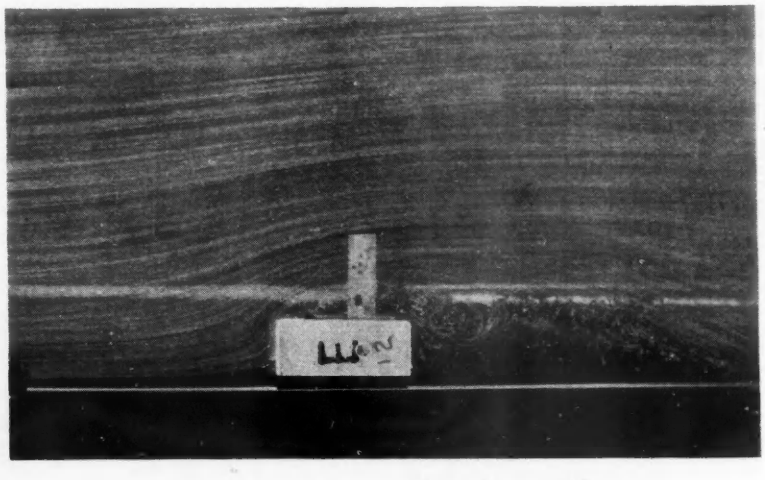
I read with great interest the article on Streamlined Cars by Mr. Andreau, in your issue of July 21. I notice that he used the "reflection and image method" in his tests and was rather surprised to see that while he claims this method to be absolutely correct, he does not give any references to proof of the principle involved.

It has occurred to me that your readers might be interested in the results of an investigation regarding the validity of the principle by an entirely new method. This investigation was carried out in 1933 at Carnegie Institute of Technology under the guidance of Professors W. Trinks and A. H. Blaisdell, by the writer in colloboration with W. W. Justice.

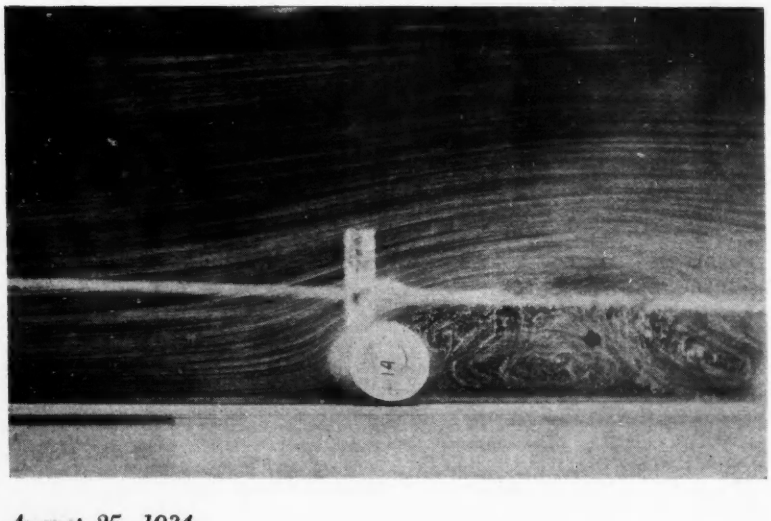
The tests were made in a water channel built at the Institute in 1931-32 and a thesis on these tests was presented in partial fulfillment of the requirements for the degree of Master of Science in Mechanical Engineering by the writer and Mr. Justice. Additional details of the tests may be obtained from the Thesis.

The water channel measures 14 ft. by 40 in. by 10 in. and is filled with water to a depth of 8 in. Running on rails on top of the tank is a carriage on which are mounted a camera and a bank of lamps for illuminating the surface of the water below the camera. The model is suspended from this carriage. A variable-speed electric motor serves to move the carriage on the tank. The surface of the water is covered with lycopodium powder, which renders the flow visible.

It was the object of the tests to compare flow patterns obtained when the object is moved close to the ground with those obtained with a fictitious ground, as in the reflection method. To obtain the first type of flow pattern a board was introduced into the tank and placed at the desired distance from the moving model. In the application of the reflection method two models were mounted in opposition. The models used were cylinders of either circular or rectangular cross section. A large number of photographs were taken, with wide variation in the distance between models and either the actual or hypothetical ground, and four of them are reproduced herewith.

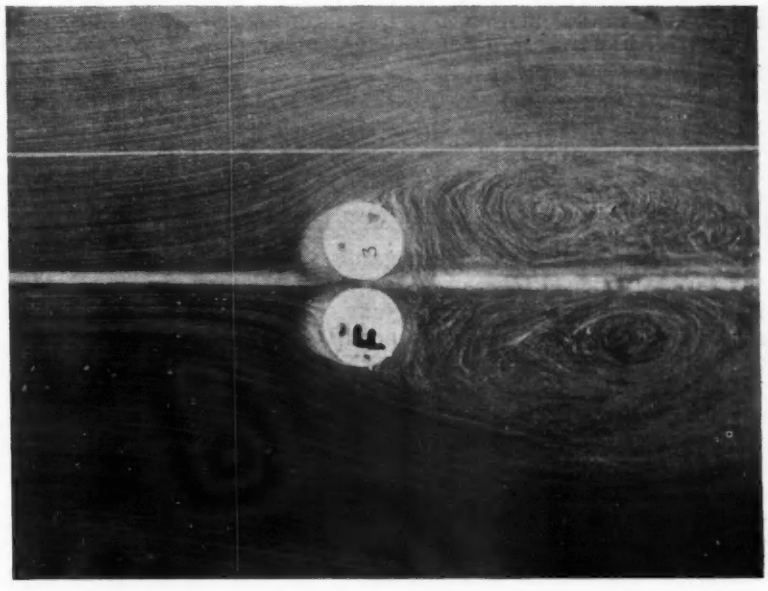


Flow lines with fictitious ground

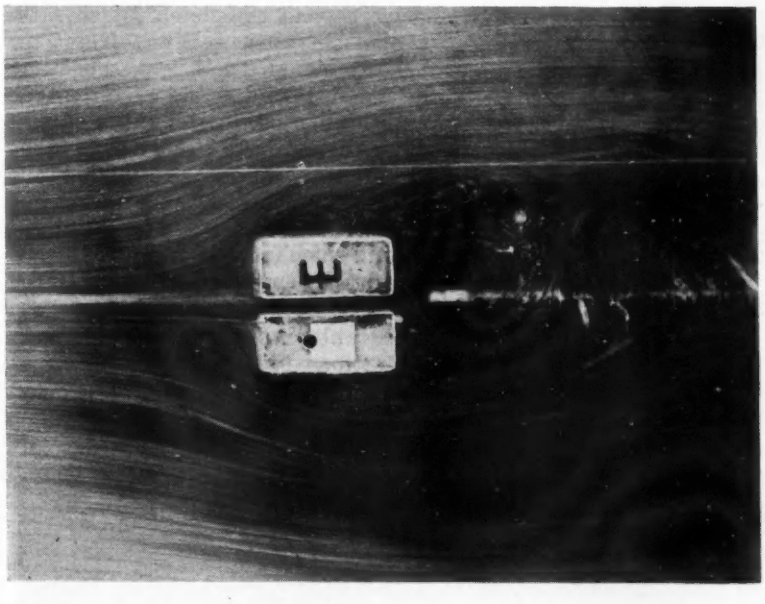


An examination of these photographs leads to the conclusion that the principle of aerodynamic reflection does not hold for two-dimensional flow with eddy formation. The flow through the gap between two similar models will not remain symmetrical about the median line

of the set-up, but will cross from one side to the other as eddies are being formed. Thus it is seen that the theoretical rectilinear flow line between the models does not exist under actual conditions and that the flow behind one model is definitely not a mirror image of that behind the other. On the contrary, it seems that the flow behind a pair of models separated by a small gap more nearly approximates that behind a single solid block.



Flow lines using reflection method



The reason for the discrepancy between theory and observed results may be explained by a consideration of the vortices leaving such a system. As a symmetrical double row of vortices is not stable (see Hydrodynamics, Lamb, fifth ed., p. 220), the state of existence of the vortex on one side of a pair of models cannot be the same as that of the vortex on the other. This will result in a difference of pressure between the two points. Fluid passing through the gap enters the region of lowest pressure, and the existence of this region of low pressure is the cause of the cross flow observed in the photographs.

It is possible that the "reflected" models could be far enough apart so that the two systems of vortices formed by the bodies would not interfere with each other. The tests conducted indicate that such a condition could exist only if the distance between the model and the imaginary ground were much greater than in the case of actual surface vehicles. This makes it unreasonable to apply the principle of aerodynamic reflection in testing scale models of trains, street cars and automobiles. Neither is it correct to apply it in comparisons of the air resistances of streamlined and unstreamlined surface vehicles, as the error due to the method would not be of the same order in the two cases.

IGOR J. KARASSIK.

Sway Angle as Dependent On the Suspension System

Editor, AUTOMOTIVE INDUSTRIES:

Referring to Mr. Heldt's article on Car Sway Angles, may I add my own findings in the case?

I agree with the formula given for the sway angle, but I have gone a bit farther and found that this formula can be interpreted in a general way. The formula as given is

$$tg.\ \theta = \frac{2\ C\ D}{r\ E^2},$$

where θ is the angle of sway;

C, the centrifugal force in lb.;

D, the distance from the center of gravity to the instantaneous center of rotation;

r, rate of springing (not of springs), in lb. per in.;

E, the spring base or wheel tread in in.

In a conventional car the instantaneous center of the body is on the spring base; in a car with independent suspension with parallel motion of the wheels the center is on the ground. In any other car with independent suspension the instantaneous center can be found by the

method of virtual motion.

The rate of springing in lb. per in. of deflection, as measured at the wheel, is represented by r. The spring itself may have any rate whatever, and only the motion of the wheel relative to the plane of the car frame is taken into consideration.

It will be seen that as long as the rate of springing remains constant the real criterion of the sway angle is the expression D/E^2. Let us take as an example a real car equipped first with conventional and then with independent springing, the rate of springing being the same in both cases. In the case of the independently sprung car D was 24.1 in., while for the conventional car it was $24.1 - 9.2 = 14.9$ in. (9.2 in. is the height of the axle above the ground). E was 60.5 in. for the independently sprung car and 35.375 in. for the other. We then have

$D/E^2 = 14.9/37.37^2 = 0.0119$ for the conventional car

and,

$24.1/60.5^2 = 0.00658$ for the independently sprung car.

We thus see that for the same rate of springing the sway angle of the independently sprung car will be

$0.0065/0.0119 = 0.55$ or 55 per cent

of the sway angle of the conventional car. In other words, in an independently sprung car we can make the springing $0.0119/0.0065 = 1.81$ times as flexible as in the conventional design without increasing the angle of sway.

BORIS P. SERGAYEFF.

New Equipment Cuts Costs

(*Continued from page* 233)

test machine).
15. Mill lock slots.
16. Wash.
17. Hand-die threads.
18. File splines and pin-hole for burrs.
19. Indicate teeth for proper spacing (Last Word indicators).
20. Burnish teeth.
21. Wash.
22. Roll with master gear on Gleason test stands (100 per cent).
23. Heat treatment.
24. Grind bearing dimensions to size, tolerance 0.0005 in.

The production cycle for this part delivers 230 pieces per hour for passenger cars; 50 per hour for trucks.

In similar fashion the spiral ring gear goes through the following steps:

1. Rough and finish back and OD and finish face; bore and counterbore holes; turn web and chamfer (Bullard operation).
2. Ream bore to size.
3. Drill 12 rivet holes (Natco drill, special fixture).
4. Countersink 12 rivet holes (Natco drill, special fixture).
5. Stamp part number and Chevrolet emblem.
6. Grind back (Walker grinder).
7. Finish turn OD and face (Bullard).
8. Inspection (100 per cent) for back, face, OD, etc.
9. Rough cut teeth (Gleason).
10. Champfer teeth (special set-up on Bilgram machine).
11. Finish cut teeth (15-in. Gleason generator).
12. Try out for proper tooth bearing (Gleason test machine).
13. Wash.
14. Roll (100 per cent) (Gleason test machine).
15. Heat treatment.
16. Grind bore.

While the routings are self-explanatory as to the principal steps in the process, we should like to emphasize the several 100 per cent inspection operations that contribute to the certain interchangeability of the parts and assure quality control. Note that the pinion is subjected to three such checks, the last one, operation 22, being designed to assure correct mating of the pinion and ring gear, while Operation 14 on the ring gear performs the corresponding service.

Since it is quite beyond the scope of any brief treatment to cover even a small proportion of the activity in detail, we have selected a few of the new machines and will let them tell their own story in the accompanying illustrations. One of these deserves special mention, since this is probably the first installation of its kind in the automotive industry.

This machine is the No. 9 Gleason combination straight tooth rougher and finisher used here for differential pinions. It is a four-spindle machine and completely finishes the pinion in one setting from the turned blank. Teeth are rough cut by the inserted tooth cutter at the right, finished by the single-point cutter at the left. Blanks are loaded at the top spindle, requiring the operator to move the paddle to one side. This position cuts out the indexing mechanism which remains inoperative until the paddle drops to its normal position.

Suitable captions on the other illustrations explain the function of the several interesting items of equipment.

Gleason burnisher set up for burnishing the pinion. The pinion drives the gear which is of the same material as production gears but with special tooth form. Ring gear oscillates during the operation, the machine stopping automatically after a predetermined number of cycles have been made

PRODUCTION LINES

Stepped Up

Cut-off wheels bonded with Bakelite now run at speeds up to 16,000 ft. per min. Wheels bonded with Bakelite were first developed for cut-off operations but their usefulness is spreading. One of the most important of new applications is for snagging in foundries and more recently such wheels have been applied to the grinding of camshafts, valve stems, forming and sharpening cutting tools, etc. The story behind the development of high-speed abrasive wheels bonded with Bakelite resinoid is found in an interesting booklet, just off the press.

With Cyanides

An operating manual for copper, brass, bronze and zinc plating with copper and zinc cyanides has been prepared by the technical staff of the "R & H" Chemicals Department of the du Pont Company.

Under twenty-two divisions of the subject there are such discussions as the advantages of using metal cyanides; commercial value of metal cyanides over acid solutions; copper plating preparatory to localized hardening of steel; preparation of plating baths, formulas for solutions, methods of analysis and so on.

Exploits Palladium

Palladium, a by-product of nickel refining, is beginning to bulk large in the business of the International Nickel Co. In fact Canada now is the world's largest producer of this member of the platinum family. Possessing for electrical purposes qualities similar to platinum, the metal is finding extensive use for contact points. Palladium sells below the price of gold, is resistant to all but concentrated nitric acid, and is non-tarnishable. Like gold, palladium can be beaten into leaf, which in turn may be used for decorative purposes.

To Identify

A large machine tool manufacturer, in an effort to practise what he preaches, has set a deadline on the age of productive equipment in his plant. It's cleverly done. Each machine in the plant has an identification symbol painted on, giving at a glance its present service life. For identification they use military stripes; one chevron for five years, two chevrons for ten years, and special markings like wound stripes for the aged. Here is something of real practical value that can be utilized at little expense.

Plylock Joint

Goodrich engineer perfects revolutionary method of making endless belts. The improved construction, known as the "Plylock Belt Joint," is said to overcome a difficulty experienced to some degree with all step belt joints—a tendency of the outside seams to open up during severe service. The idea is to imbed or countersink the seam below the surface of the belt in such position as to relieve the seam from strain and shield it from wear or windage. This protection is made possible by a thick cushion of rubber reinforced with bias fabric permanently vulcanized into position.

Hobos Stymied

News reports have it that the hoboes annual convention passed a resolution asking for a scaling down of railroad fares to one cent a mile. This would permit them to travel without recourse to brake rods. The last straw is the coming of the streamlined train. "How is anybody to ride the rods on that thing," they moaned.

New Guide

The art of spraying metal has assumed the stature of a large and substantial commercial process. And from now on its progress will be charted by a handsome publication —"The Metallizer"—which is full of practical information right from the firing line. If you are not familiar with this magazine, now is a good time to investigate.

Helps Workers

Current Safety Council letter shows the humanitarian side of mechanical aids in production. In certain industries and certain operations in many plants, much heavy lifting has to be done by the man on the job. And to this type of physical labor many cases of hernia and strains are chargeable. The solution is the installation of materials handling equipment to do the heavy lifting. Here is an excellent example of the machine conserving and preserving the well-being of the worker.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Research Reveals Nature of Two-Bearing, Four-Cylinder

MANY of the small four-cylinder engines used in European "baby" cars are fitted with crankshafts supported in two main bearings only. While this type of engine has practically vanished from the American passenger-car field, it would naturally be considered for marine and industrial applications where four cylinders meet the requirements, which makes the behavior of these engines in service a matter of practical interest.

It is directly obvious that a four-throw crankshaft supported only at the ends must flex considerably under the forces acting on it, which are due to inertia of reciprocating parts and to gas pressure. In recognition of this fact, these crankshafts are made as short as possible and with all elements of relatively heavy section. Even when such precautions are taken to keep down the flexing, considerable trouble is often experienced. The writer remembers that in one such engine, which was fitted with babbitt bushings in the connecting-rod big ends, the flanges of these bushings would persistently break off, evidently due to excessive flexing of the shaft.

Other troubles with such engines which can be traced to crankshaft flexing are excessive wear of the front main bearing and of the oil seal. Fatigue failures of the crankshafts are not uncommon, and the flywheels often have a wobbling motion which results in slipping of the clutch.

Experimental Equipment Simple

An experimental investigation of transverse vibration of such crankshafts has been made by Dr.-Eng. Werner Riede and is reported by him in ATZ. The equipment employed was of the simplest kind. A flat mirror was secured to the forward end of the projecting crankshaft and a point source of light was arranged close to the axis of the crankshaft. The beam of light from the source is reflected by the mirror onto a screen at some distance from the end of the crankshaft. When there is no crankshaft vibration, the spot of light on the screen remains stationary, whereas when the crankshaft vibrates the light describes a closed curve on the screen which corresponds to one cycle of vibration. What is actually recorded on the screen is the vibration of the forward end of the crankshaft. The rear end tends to vibrate in an exactly similar manner but is restrained by the flywheel, and this results in a wabbling motion of the flywheel which is responsible for clutch slippage.

In Fig. 1 herewith are shown, on the left, a series of diagrams taken from an engine of this type while being "motored" at different speeds. The bending moments on the crankshaft are then due exclusively to inertia forces on the reciprocating and rotating masses. It will be noted that for each revolution of the crankshaft the deflection from the neutral position passes through three maximum values. At the critical speed of about 3100 r.p.m. the crankshaft returns practically to the neutral position between successive maximum deflections. At all other speeds, however, the shaft is flexed perceptibly throughout the cycle. There were no noises of any kind while the engine was being motored, not even at the critical speed of 3100 r.p.m.

The diagrams on the right in Fig. 1 were taken while the engine was being run under its own power, under full throttle and at the same speeds as those at which the diagrams on the left were taken on the motored engine. When the engine is being run under load the crankshaft really acts as an indicator, any increase in gas pressure in one of the cylinders forcing the central portion of the crankshaft down and causing an upward motion of the free end of the shaft.

Points corresponding to crank positions separated by 45 deg. are marked in on all of the diagrams. Point 1 corresponds to ignition in Cylinder No. 1; point 5 to ignition in Cylinder No. 3; point 9 to ignition in Cylinder No. 4, and point 13 to ignition in Cylinder No. 2. The pressure in the cylinder reaches its maximum value slightly after top dead center, so that the deflection becomes a maximum somewhat beyond the ignition points, substantially at points 2, 6, 10 and 14. This can be readily checked on all of the diagrams taken at low speeds.

The Diagrams Check Maximum Deflection

For all of the higher speeds, at which the inertia forces have considerable values as compared with the total gas pressures, the diagrams are made up of two loops which together represent a 720-deg. cycle. The effect of the gas pressure can be readily traced in these diagrams also. It must be remembered, however, that within this speed range an increase in the gas pressure has the effect of reducing the load on the connecting-rod bearings, so that under full load the crankshaft is flexed less at the ignition points than at any other parts of the cycle. This can be clearly seen in the full-load diagram for 2900 r.p.m.

At point 1 crank No. 1 is in the upper dead center position and ignition takes place in its cylinder. The resulting gas pressure reduces the load on the crankpin due to inertia forces, which tend to deflect the crankshaft upwardly, so that the influence of the inertia forces on cranks 2 and 3 becomes more apparent. The result is a downward flexing of the crankshaft, and hence an upward deflection of the free end of the crankshaft. At point 5 crank No. 1 is in bottom dead center and ignition takes place in cylinder No. 3. Inertia forces on cranks 2 and 3 flex the shaft upwardly. These forces are suddenly greatly reduced by the explosion in cylinder No. 3, so that the crank is instantly relieved of load

Vibrations in Crankshafts

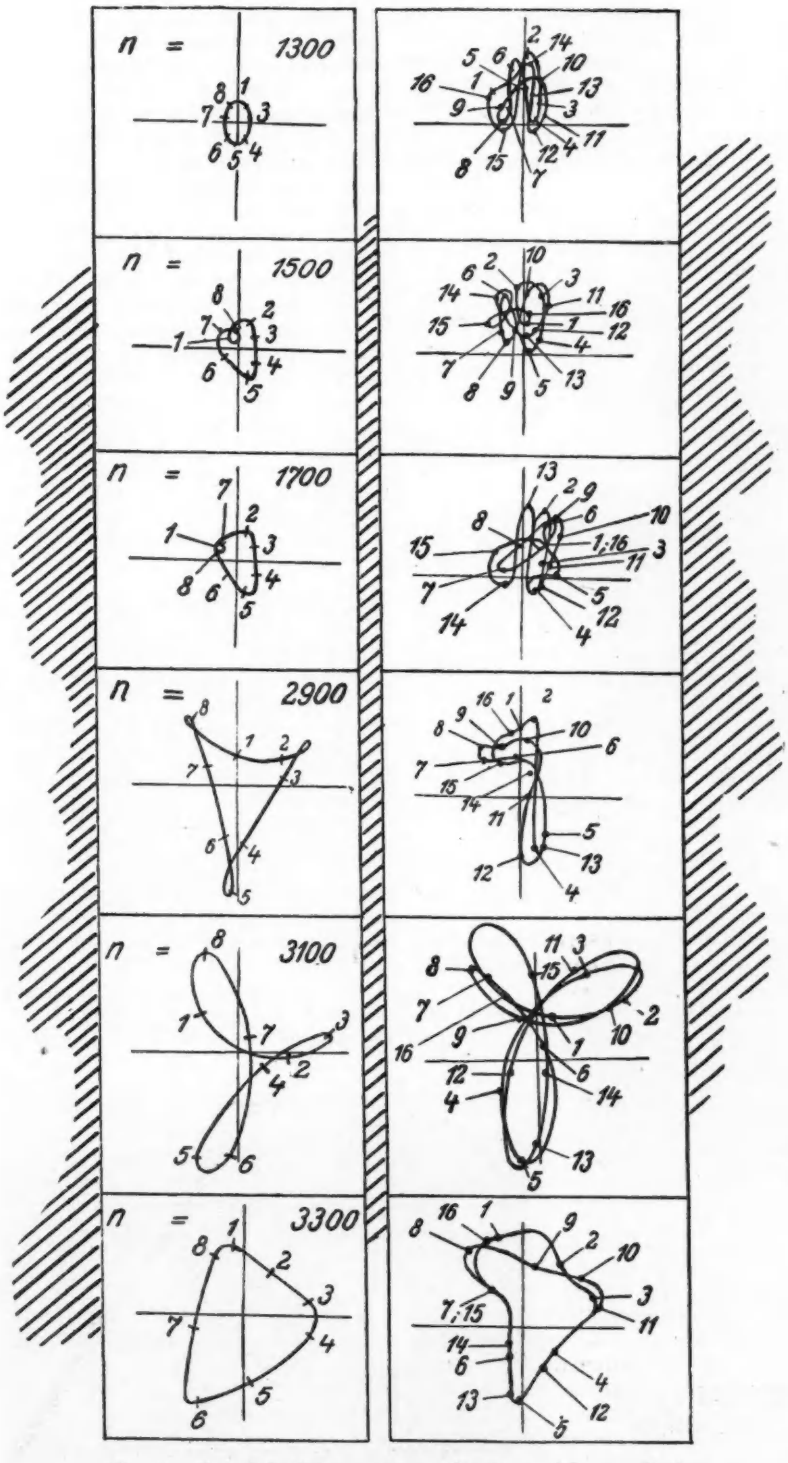


Fig. 1—Crankshaft transverse vibration of four-cylinder two bearing engine when motored (left) and run under its own power (right)

and from the maximum deflection returns directly to the neutral position. At point 9, where cylinder No. 4 explodes, the effect is very similar to that at point 1, while at point 13 the effect is the same as at point 5 and there is the same instant return from nearly maximum deflection practically to the neutral position.

Thus the characteristic feature of the diagrams obtained with the engine running under full load is that at low speed the crankshaft is bent downwardly whenever an explosion occurs, as indicated by an upward motion of the free end of the crankshaft. With the engine used in the tests, a distinct double-loop diagram was obtained only at speeds above 2200 r.p.m. at which the inertia forces are quite important as compared with the gas-pressure forces. The critical speed is marked by a diagram which is quite similar to that obtained while the engine was being motored.

The same indicating apparatus was applied to an engine with three main bearings on the crankshaft, and in that case the free end of the shaft was found not to vibrate noticeably.

An increase in the dimensions of the two-bearing crankshaft did not eilminate the vibrations. The amplitudes were slightly reduced and the critical speed was raised somewhat.

It was observed that under full load the engine was very rough at certain speeds between 1700 and 3100 r.p.m. The noise increased rapidly over a short speed range and fell off quite rapidly when the upper limit was passed. The roughness was greatly reduced when the two central cylinders were operated with a lower compression ratio than the other two, and it disappeared almost entirely when ignition was cut off from the inner cylinders.

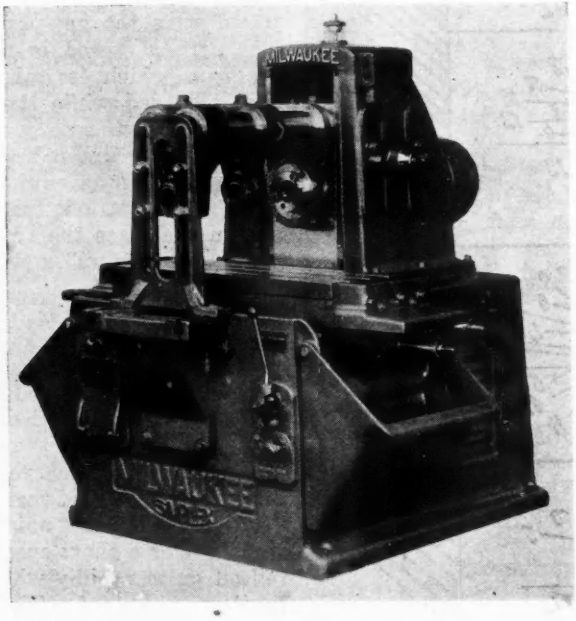
Within this speed range the crankshaft vibrates strongly even when the engine is being motored. These vibrations, resulting from inertia forces, are interfered with to a considerable extent by the gas pressures in cylinders Nos. 2 and 3. Dr. Riede thinks there may be a connection between the disturbance of the comparatively simple inertia-force vibrations and the roughness of the engine. To the writer a better explanation would seem to be that the roughness is due to synchronism between the period of free transverse vibration of the crankshaft and harmonics of the gas pressure curve, which results in amplitudes of vibration much greater than could be produced by a single load cycle. —P. M. H.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

New Automatic Milwaukee Miller

Milwaukee Simplex and Duplex bed type milling machines, first introduced by Kearney & Trecker Corp., Milwaukee, Wis., in 1930, are now provided with complete "two-way" automatic control. With this new feature, the table can be operated automatically or manually, or with a combination of both—whichever control is most convenient for the immediate job.



To obtain complete automatic control, a small, compact hydraulic operator, or control unit, has been designed and is incorporated in the saddle of the machine. This unit affords complete automatic control in a great variety of milling cycles, both one and two-way, with or without automatic spindle stop, depending on requirements.

In previous practice the clutch was withdrawn mechanically at the feed rate speed. This slow withdrawal of the clutch subjected it to severe strain, and thus greatly limited the accuracy of the point of reversal.

The automatic reverse is always followed by an instantaneous shift to rapid traverse. A simple interlock provides that the reverse clutch must be completely engaged before the engagement of rapid traverse, resulting in smooth, quiet operation and avoiding clashing of clutches at rapid traverse speed.

When a machine is to be used for climb cutting, a hardened screw and special take-up nut are furnished at an additional cost. The application of this method of milling is increasing, especially for cutting steel.

Anyone of three feed ranges is obtainable. There are 18 changes within each range: ½ to 20 inches per minute; 1 to 40 inches per minute; 2½ to 100 inches per minute.

The four speed ranges available are: 20 to 135 r.p.m., 40 to 270 r.p.m., 75 to 500 r.p.m., 150 to 1000 r.p.m.

There are 10 changes of speed in each range. Speed ranges can be changed in the field. It is desirable to always select the lowest speed range containing the necessary speeds.

Fedders Making Industrial Heaters

Announcement of the Series 3 line of Unit Heaters with important improvements to meet the requirements of industrial applications is made by the Fedders Manufacturing Company, Buffalo, N. Y.

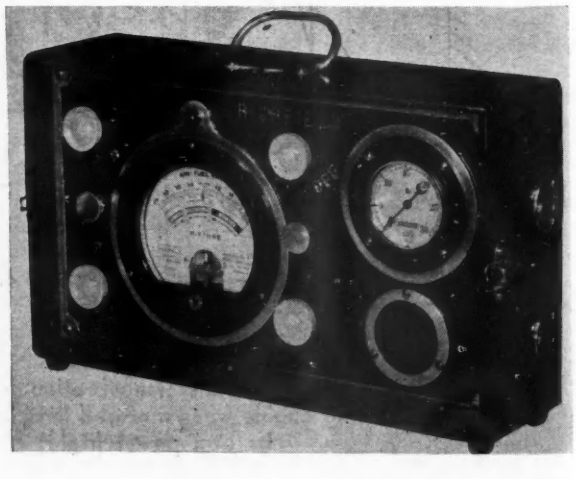
Cabinets are unusually sturdy, being electrically welded into one piece with integral reinforcing members providing a high degree of strength and rigidity. Special attention has been paid to quietness. Streamline tubes, patented fins and sturdy cabinets combined with resilient motor mountings eliminate resonance and isolate vibration.

Streamline tubes provide large steam ways. Header tanks have integral baffles to assure even steam distribution throughout the element. Specially designed Full Floating mountings maintain the alignment of the heating element within the cabinet, eliminate expansion stresses between element and cabinet and protect the element from piping strains, it is claimed.

These heaters are made in a complete line of capacities up to 1200 sq. ft. E. D. R. steam.

Richfield Offers Exhaust Analyzer

A portable exhaust-gas analyzer has been developed by the Richfield Oil Co., and will be marketed by the Zenith-Detroit Corporation. The apparatus, which is illustrated herewith, can be carried on the car, and analyses of the engine exhaust therefore can be made while the engine is under load. A long rubber sampling tube with a clamping device can be attached to the exhaust pipe of the car to carry exhaust gas to an Engelhard thermal conductivity cell. The galvanometer of this cell, instead of being graduated in electrical units, is graduated in terms of mixture ratio, so the operator can read off directly the



Richfield exhaust-gas analyser

proportion of air to fuel in the mixture supplied by the carburetor.

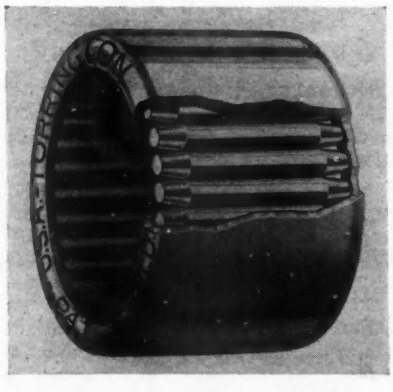
It is stated that the instrument can be used also for tests in the service station, but as the engine is then being run without load, some correction must be made for load conditions. The vacuum gage incorporated in the apparatus shows the relative load on the engine. Advantages claimed for the apparatus are that it is light in weight and low in price.

The Engelhard thermal conductivity cell is an instrument which indicates the composition of gas mixture, its operation being based on the principle that different gases have different heat conductivities. The exhaust gas is led through a small diameter tube containing a platinum wire of high resistance which forms one leg of a Wheatstone bridge. When a current flows through this wire it heats up and its resistance changes, and with a definite voltage applied to the wire, the temperature reached by it depends upon the gaseous mixture surrounding it, that is, on the composition of the exhaust gas.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Needle Bushings for Industrial Use

The Torrington Company, Torrington, Conn., has placed on the market a bushing involving the principles of a roller bearing and requiring no more space than the usual babbitt or bronze bushing. It consists of a series of small-diameter rollers with tapered ends, which are held in a cylindrical steel shell having its ends flanged over inwardly so as to hold the rollers in place.



Torrington needle bushing for industrial uses

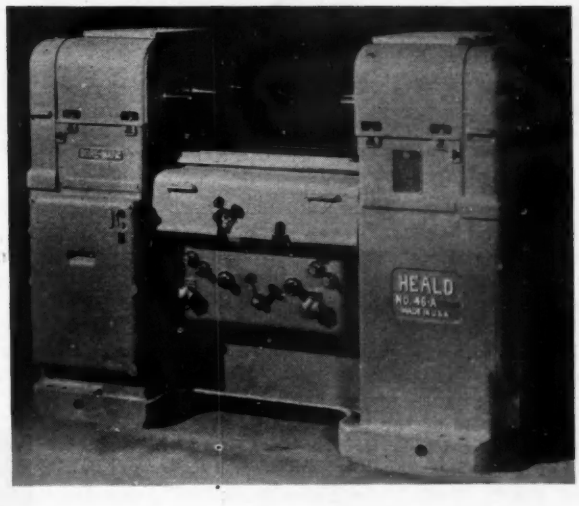
In addition to the feature of compactness, these needle bushings have the advantage that there is plenty of storage capacity for lubricant between the shell and rollers. Owing to the use of a full complement of rollers the capacity for carrying radial load is quite high. The bushings are a complete unit and therefore are easy to handle in assembling and disassembling.

The shell is made of drawing steel, cyanide hardened, while the needles are made of high-carbon steel, hardened all through to 58-60 Rockwell C, and ground on centerless grinders to tolerances of plus nothing and minus 0.0002 in. The bushings are made in sizes ranging from ½ to 1¾ in. in bore, and ½ to 1½ in. in length.

Precision Borer for Heavy Duty

The Heald Machine Co., Worcester, Mass., has announced a new heavy duty precision boring machine, the 46A double end Bore-Matic, intended specifically for mass production of single parts or a large number of pieces which might be handled in a single setting. It is provided with two bridges each having a capacity of four boring heads.

The distance between the bridges is 33 in., the standard maximum table travel is 14 in. The boring stroke at one end of the machine may be as much as 8¼ in., but not more than a total of 13 in. on both ends on the standard machine with 33 in. between bridges. While this gives plenty of room for the usual run of fixtures and work, should more room be required provision has been made for mounting the bridges back for two 2¼ steps on each end to give spacings up to 42 in. between the bridges.



The machine can be arranged to perform anyone of a number of cycles, the change from one cycle to another being comparatively simple. As an example of available cycles—by an entirely new control of the reversing valve with the introduction of a neutral position in its travel, the table is allowed to drift into a positive stop for facing, the boring heads are stopped, with sufficient allowance for cleaning up a facing cut. The facing tools are not allowed to idle in contact with the finished work to dull their edge. The timing or dwell control of the stopping of table and heads is by convenient knobs at adjacent end of reversing valve. This dwell control is effective on the movement of the reversing valve only to the neutral position; the starting of the table by the operator in opposite direction is instantaneous, by movement of a latched reverse lever.

Should it be desired to set up machine as a single end machine, with either short or long stroke, the intermediate stop valve may be set to stop the table for loading just inside the outer reversing point, or dog adjustments may be made to secure positive stop without reversal at outer position.

Boring heads are of solid on piece body type, ball bearing equipped. The standard head has a spindle with a large flange to which is bolted a suitable size quill that carries the boring tool. Fitting of the quill to the head is by the eccentric pilot and which fits in an eccentric hole. Moving the quill in either direction from the zero mark gives an adjustment of two-tenths on the diameter for each mark. With this flange type adjustable head, the setting of the tool to obtain the correct size becomes a simple and easy operation.

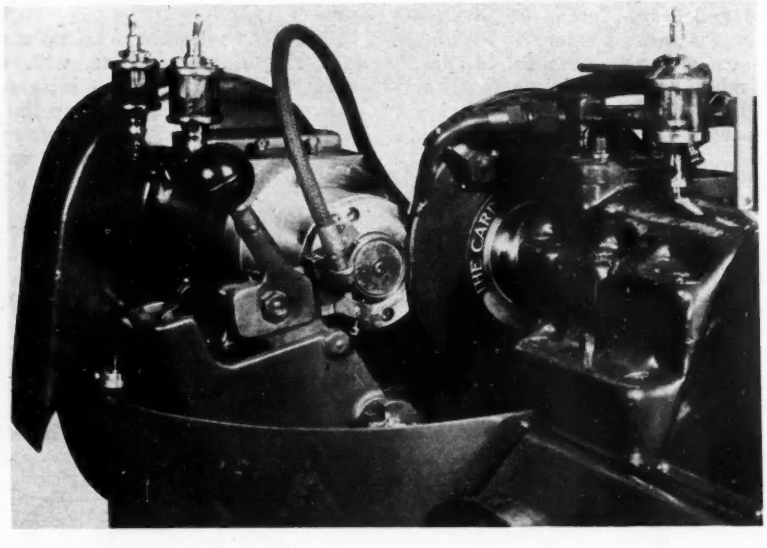
The driving motor is rated 5 hp. at 1200 r.p.m. Floor space with water tank 58¼ by 75¾ in. Net weight of standard machine without boring heads, 9500 lb.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

The Landis 5 in. Hydraulic External Race Grinder

The Landis 5-in. hydraulic external race grinder just placed on the market by the Landis Tool Co., Waynesboro, Pa., is a companion machine to the recently announced 3½-in. hydraulic internal race grinder. Like the 3½-in. internal, it has the capacity to grind all the smaller sizes up to and including the 218, 316 and 414 groups. Although ordinarily used for single row races automatically backs away and work head oscillation stops. The operator stops work rotation, swings the sizing device back to its inoperative position and reloads.

The 5-in. hydraulic external race grinder is designed and proportioned, with few exceptions, like the 3½-in. hydraulic internal race grinder. It will grind with as rapid a cut as the grinding wheel will stand up under and then finish very smoothly under a light feed, giving a remarkably quiet and chatter-free race. The outstanding feature is the Landis-Solex sizing device. It causes the machine to consistently produce raceways within limits of less than 0.0005 in. because of the entire elimination of the human element. Scrap loss is so low as to be negligible.



Net weight of the machine, without electrical equipment, is 3200 lb. Floor space required is 45 in. x 60 in. Two 1750 r.p.m. constant-speed motors are used. The wheel and pump drive motor is 3 hp., the work drive motor ¾ hp.

only, it may readily be utilized for double row races and thrust races. Larger sizes may be handled by removing the sizing device and certain other parts and operating it as a hand machine.

During grinding various machine movements take place automatically. These automatic movements are controlled from the progress of the grinding by the Landis-Solex sizing device. First, the operator places a ring on the chuck and starts work rotation. Immediately the work head starts oscillating and the wheel automatically rapid-feeds into grinding contact with the race. The hydraulic feed mechanism then comes into play and feeds the wheel at a predetermined roughing rate.

When the work is rough ground to within about a thousandth of finish size (which amount is adjustable), the feed is automatically cut down to a very fine finishing rate. If desired, the coolant is automatically cut off at this point for a dry finishing operation. As soon as the race reaches finish size the wheel

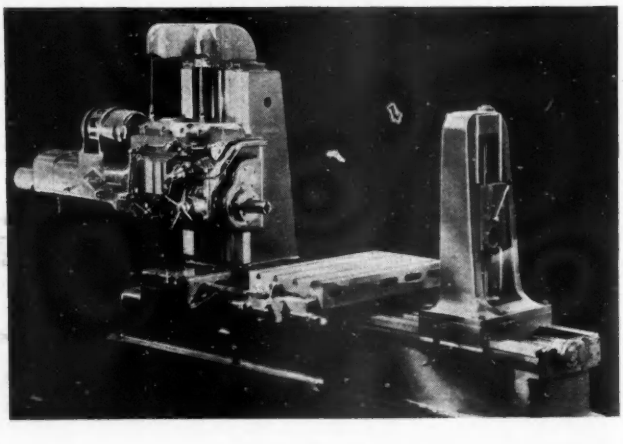
Eaton Hot Water Heater

An improved line of hot water heaters is being introduced by Eaton Products, Inc., Cleveland, Ohio. Two of the models have chromium-plated die-cast fronts, illuminated switches, patented rotating deflectors, and Hamilton Beach motors. The heating capacity is said to be increased. One of these heaters is illustrated herewith.

Perfection Model C Hot-Water Heater

Built for General Purpose Requirements

Wm. Sellers and Co., Inc., Philadelphia, Pa., has announced the No. 400 horizontal boring, drilling and milling machine for general purpose and manufacturing requirements. Its most important feature is the unit head driven by a 10 hp. constant speed motor providing a most direct flow of power to the



Sellers No. 400 horizontal boring, drilling and milling machine